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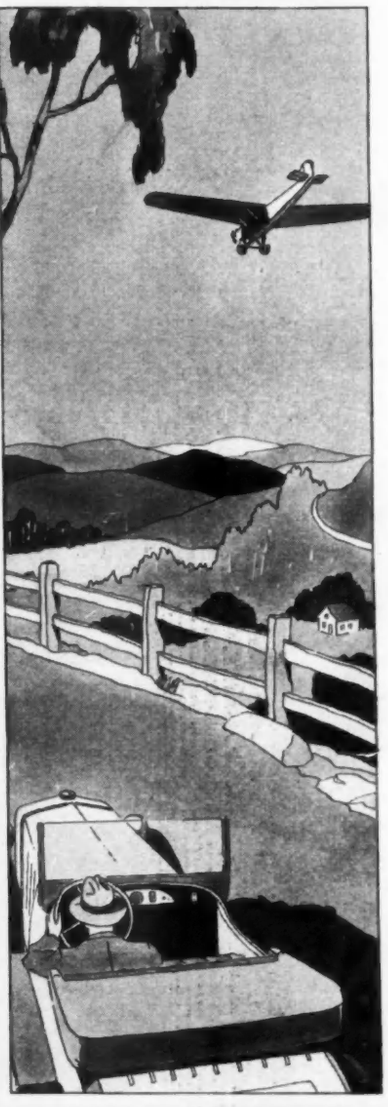

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AUTOMOTIVE INDUSTRIES

VOLUME 62 *Philadelphia, Saturday, April 5, 1930* NUMBER 14

Increasing Crude Rubber *Stocks* Revive *Control* Plan

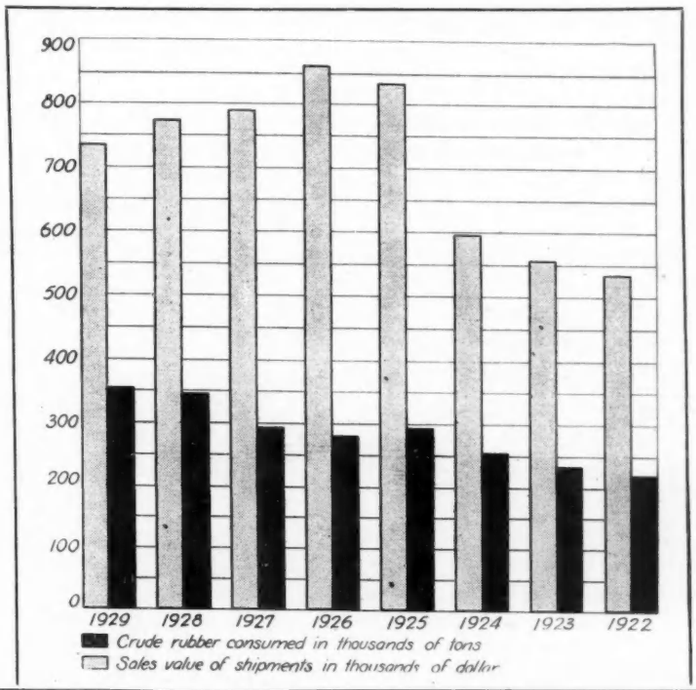
British and Dutch growers seriously considering one month's restriction of tapping to forestall further price reductions resulting from overproduction.

By A. BURDET CROFOOT

OVERPRODUCTION is again raising its head in the crude rubber field, and growers are at a loss as to what to do about it. Once before, the British producers attempted to regulate it by legislation, securing the passage of the Stevenson Act which provided for government control of the amount of rubber to be tapped during a given period. They found, however, that because of this move they were losing rapidly their position as the largest producers in the world, and secured the repeal of the law two years ago.

Being unwilling to risk further loss of supremacy, the British growers, together with the Dutch growers who hold second place as producers of this commodity, are now seriously discussing a month's holiday in tapping. It is, of course, as much to the advantage of the Dutch growers as to the British to forestall too great an overproduction. When the British were bearing the whole load of crop regulation, the Dutch growers were only too glad to profit by this to increase their own output.

Now, however, that the British are no longer willing to support the market for them, they realize that it is to their advantage to cooperate in some such movement. At the present time, the Dutch growers and many of the British growers have reached a tentative agreement to suspend all tapping during the month of May. This agreement is contingent upon securing the participation of



Crude Rubber Consumed in Tires

(In thousands of tons)

Tires and Tire Sundries	1929	1928	1927	1926	1925	1924	1923	1922
Automobile and motor truck pneumatic casings..	289,118	271,487	223,159	209,818	213,724	182,308	157,523	146,318
Automobile and motor truck pneumatic tubes...	56,683	56,403	47,505	50,608	58,802	49,632	40,892	37,820
Motorcycle tires (casings and tubes)	259	412	403	318	406	359	394	428
Bicycle tires (single tubes, casings and tubes)...	1,277	966	720	755	811	677	1,210	898
Aeroplane casings and tubes	178	116	30	..	1	14	18	529
Solid and cushion tires	8,990	12,220	13,667	15,073	18,462	15,477	18,305	18,570
All other solid tires	805	634	373	327	461	317	302	352
Tire sundries and repair materials	4,493	6,101	5,329	4,757	4,319	2,908	2,308	2,288
Total	361,803	348,339	291,186	281,656	296,986	251,692	220,952	207,203

Rubber Manufacturers Association

Sales Value of Tire Shipments

(In thousands of dollars)

Tires and Tire Sundries	1929	1928	1927	1926	1925	1924	1923	1922
Automobile and motor truck pneumatic casings..	$578,981	$622,557	$624,746	$680,026	$618,266	$467,361	$439,803	$423,271
Automobile and motor truck pneumatic tubes...	82,931	94,854	99,567	121,891	117,631	83,408	70,960	62,307
Motorcycle tires (casings and tubes)	1,348	1,834	2,128	2,083	2,189	1,389	1,540	1,582
Bicycle tires (single tubes, casings and tubes)...	2,877	2,845	2,470	2,860	3,011	3,255	4,309	3,533
Aeroplane casings and tubes	454	411	839	425	450	335	129	2,258
Solid and cushion tires	17,203	24,694	33,190	36,098	40,842	27,672	29,630	27,877
All other solid tires	2,365	2,602	1,032	898	1,440	516	775	1,027
Tire sundries and repair materials	16,868	21,269	21,447	22,514	19,830	14,480	11,317	10,338
Total	$703,027	$771,066	$785,419	$866,795	$803,659	$598,416	$558,463	$532,193

Rubber Manufacturers Association

producers representing at least 70 per cent of the 1929 production. Some of the British producers, remembering their earlier experience in restriction, have evinced an unwillingness to adhere to such a scheme, particularly as it seems probable that a month's holiday will result in a reduction of only about 3 per cent in the year's output. This is due in part to the expected increased yield per tree following the month's rest, and in part to the fact that "native" rubber will doubtless be brought in in larger quantities during the suspension.

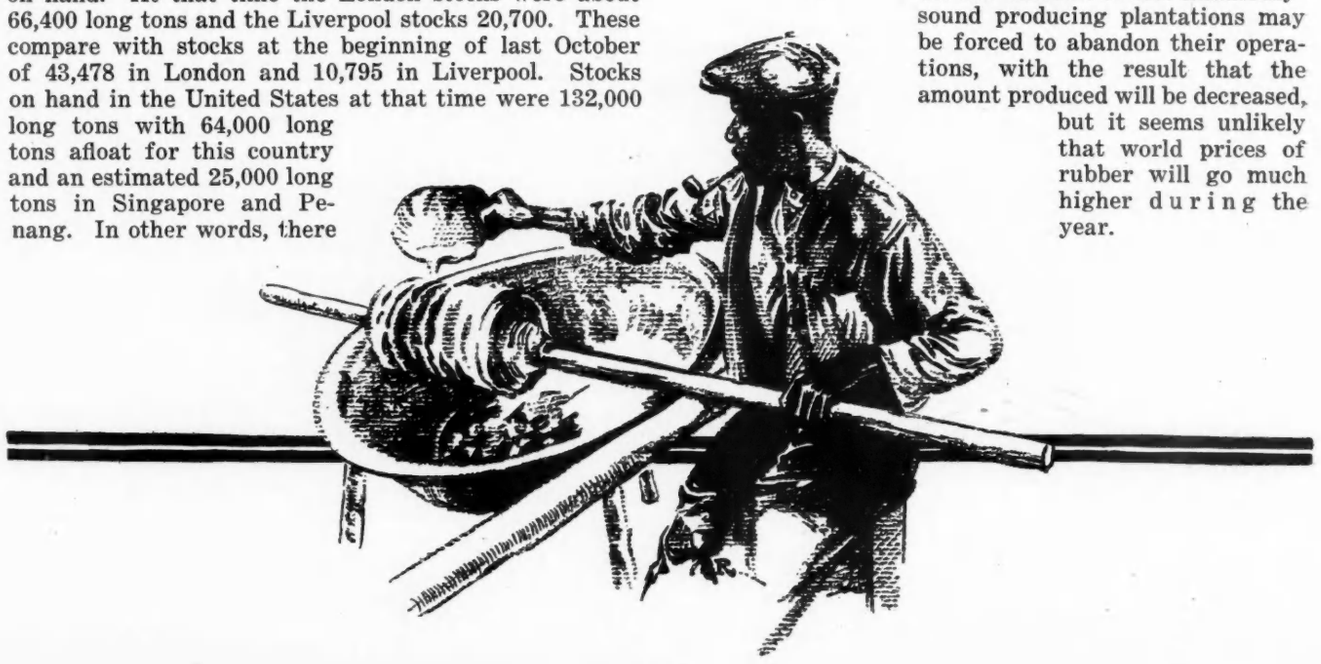
Let us examine some figures and see just what the likelihood of overproduction for this year is. On Jan. 1 of this year, there was a carryover in stocks in this country of 105,137 long tons, which together with stocks abroad and afloat made a total available stock of about 279,000 long tons. In 1929 there was a carryover of around 231,000 tons, and in the year before that one of 273,000 tons. But probable production for this year is put at from 830,000 to 846,750 long tons, making an apparent available supply of from 1,109,000 to 1,125,877 long tons. Consumption for the year is estimated at 470,000 long tons for the United States and 360,000 long tons abroad, making a total consumption of about 830,000 long tons. This, incidentally, is believed by some authorities to be rather a high estimate for consumption. At best, therefore, there will probably be a large increase in stocks at the end of this year as compared with the past two years.

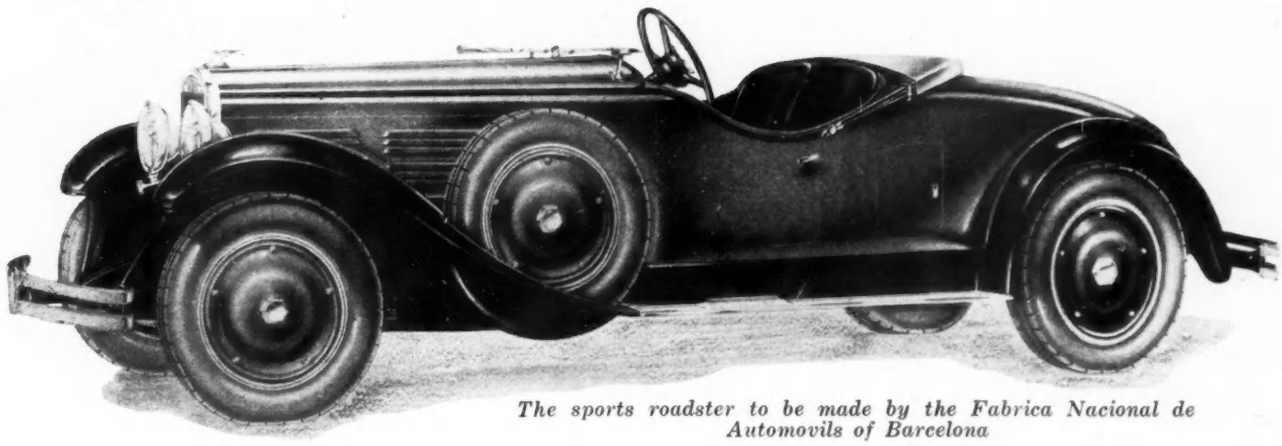
The picture as of March 8 presents even a clearer idea of the growth in stocks of crude rubber actually on hand. At that time the London stocks were about 66,400 long tons and the Liverpool stocks 20,700. These compare with stocks at the beginning of last October of 43,478 in London and 10,795 in Liverpool. Stocks on hand in the United States at that time were 132,000 long tons with 64,000 long tons afloat for this country and an estimated 25,000 long tons in Singapore and Penang. In other words, there was visible at that time a world stock of about 308,000 long tons or over 60 per cent of the estimated requirements of the United States for the year, and almost 40 per cent of the estimated world requirements for the year.

Greater interest in the rubber shares on the New York Stock Exchange recently, has been due to the better feeling regarding this industry. Officials of the leading companies are credited with being more optimistic regarding the outlook than they were late last year. Earnings of the leading rubber companies are said to be better than anticipated two months ago.

Reports of slightly increased operations at tire factories at Akron have caused members of the Rubber Exchange to revise upward their estimates of March rubber consumption. Consumption for the month by American manufacturers is now estimated at between 38,000 and 39,000 tons, against previous estimates ranging between 37,000 and 38,000 tons.

As might be expected, all this has not been without its effect on the price of crude rubber. A year ago, the price of rubber was creeping up toward 30 cents a pound, although the prevailing price during the year was nearer the 20-cent level. As this is being written, crude rubber is selling at around 15 cents a pound for the nearby positions, and around 17 cents a pound for the more remote positions. Whether these prices will continue, is a question, as it is claimed by some that crude rubber costs in the neighborhood of 15 cents to produce. If prices continue around this level too long, some of the less efficient or less financially-sound producing plantations may be forced to abandon their operations, with the result that the amount produced will be decreased, but it seems unlikely that world prices of rubber will go much higher during the year.





The sports roadster to be made by the Fabrica Nacional de Automovils of Barcelona

Spain to Produce an Eight

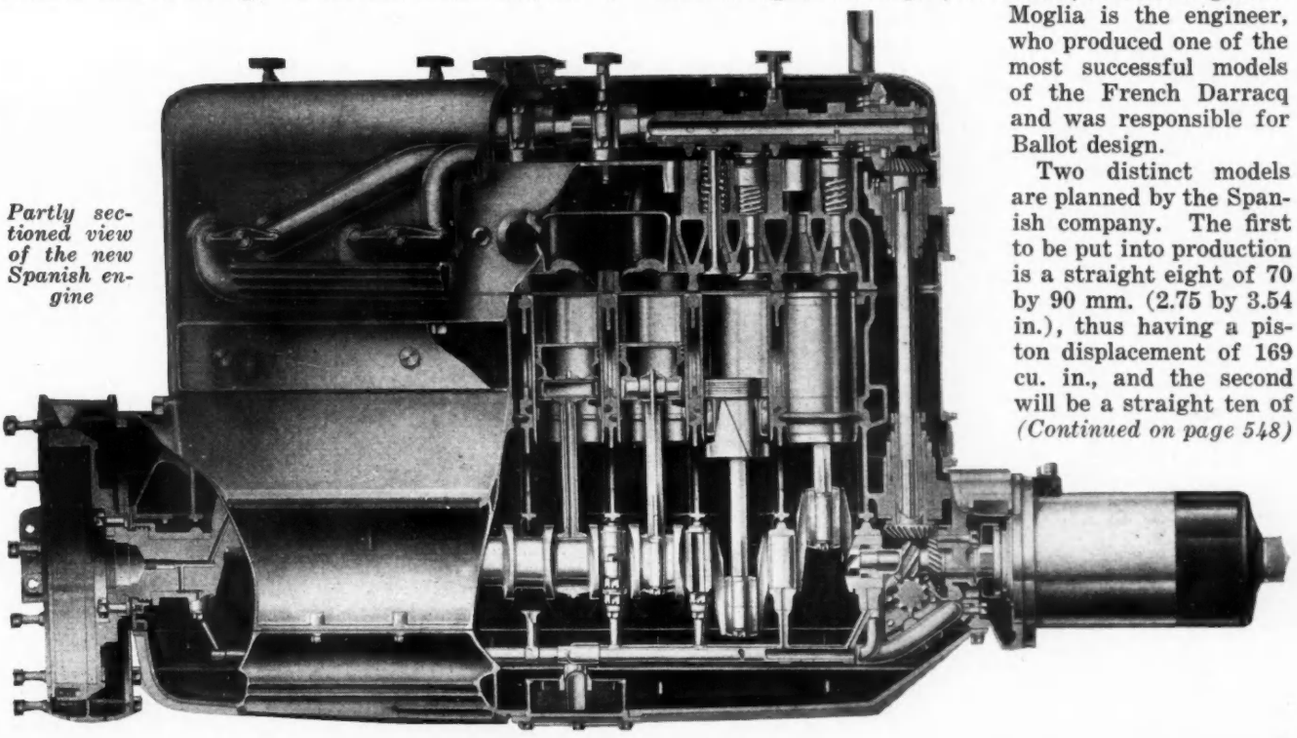
Fabrica Nacional de Automovils, organized with government aid, will be exempt from taxes and import duties on parts

By W. F. BRADLEY

SEEKING to develop a national automobile industry, the Spanish Government is backing the recently formed Fabrica Nacional de Automovils, at Barcelona, which has a capital of 16,000,000 pesetas, to be increased later by Government participation to 70,000,000 pesetas. Among the advantages enjoyed by this company are free importation of parts and raw material required for the construction of automobiles, and exemption of owners from automobile taxes for a period of eight years.

Attempts have been made for the last two or three years to induce foreign automobile manufacturers to erect factories in Spain. The main lines of these schemes were assembly of foreign parts at the outset, with later complete production in Spain. American, French and British makers were approached, but in all cases they appeared to consider that the market was too restrictive and too individualistic to warrant the erection of a factory.

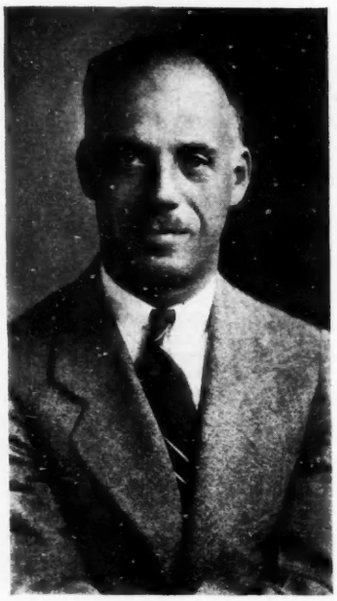
The Fabrica Nacional is independent of existing automobile concerns. The financial arrangements were made by Signor Pescara, an Argentine with important automobile and aviation connections in Europe, who selected Signor E. Moglia, an Italian, as chief engineer. Moglia is the engineer, who produced one of the most successful models of the French Darracq and was responsible for Ballot design.



Partly sectioned view of the new Spanish engine

Two distinct models are planned by the Spanish company. The first to be put into production is a straight eight of 70 by 90 mm. (2.75 by 3.54 in.), thus having a piston displacement of 169 cu. in., and the second will be a straight ten of

(Continued on page 548)



Captain L. M. Woolson, aeronautical and experimental engineer, Packard Motor Car Co., who has been in charge of the Diesel development since its inception

Packard Completes *Diesel Developing* 225 h.p.

Full description announced by the rumors. The crankcase, an out weighs only 34 lb. and is a sin

By ATHEL F.

COINCIDENT with the opening of the All-American Aircraft Exposition at Detroit on April 5, the Packard Motor Car Co. announced and made the first public showing of the high-speed Diesel engine which it has been developing for the past two or three years. In point of view of interest in the aeronautical industry, the development of this engine has been comparable to that period in 1927 when the Ford Motor Co. was endeavoring to get its Model A into production, before the announcement was finally made. There have been just as many baseless rumors about this engine and its characteristics. Hence the first public showing thereof will be quite a revelation to the aircraft fraternity which has been speculating on the unit's performance possibilities for months.

Basically it is a four-stroke, mixed-cycle, solid-injection, nine-cylinder, radial, air-cooled Diesel. By mixed cycle is meant that combustion takes place under conditions of variable volume and variable pressure. The engine develops 225 hp. or better at 1900 r.p.m. and weighs 510 lb. dry and without propeller hub, which is equivalent to 2.27 lb. per b.hp.—an astonishingly low specific weight for a powerplant of this type. Its fuel consumption ranges between 0.36 and 0.48 lb. per hp. per hr., the oil consumption around 0.05 lb. per hp. per hr. The fuel used in the U. S. Army Air Service test (which the engine has passed) was domestic furnace oil with a flash point of 160 deg. Fahr.

The bore and stroke are 4 13/16 and 6 in. respectively, giving a piston displacement of 980 cu. in., which makes the specific output 0.23 hp. per cu. in. Installation dimensions of the Packard Diesel engine are comparable to those of other air-cooled radial aircraft engines; it has an overall diameter of 45 in. and is provided with an eight-stud mounting ring 22 in. in diameter. Thus, while the engine differs greatly from the conventional radial type structurally, its installation involves no difficulty.

That there should be important structural differences compared with the conventional radial engine would be expected when the low weight of the engine is considered in connection with the fact that cylinder pressures in a Diesel engine are far in excess of those encountered in gasoline engines. Cylinder, crankshaft and crankcase stresses are so much higher that proportional increases in structural strength by a mere increase in mass are obviously out of the question where weight is as important a consideration as in aircraft engines.

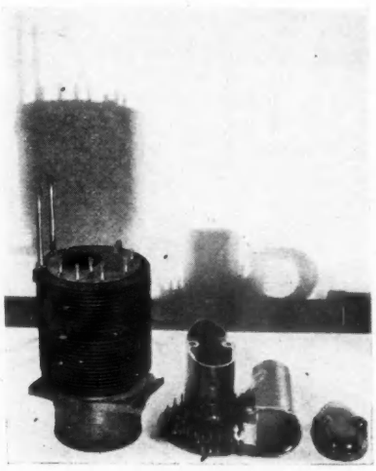
Moreover, the danger of structural failure due to fatigue is vastly increased with the higher values of the alternating stresses as engine speeds are increased. High-speed Diesels heretofore have been operating in the neighborhood of 1200 to 1600 r.p.m. The Packard Disel, on the other hand, is rated at 1900, and no doubt, is capable of considerably higher speeds, as sufficiently high safety factors are incorporated in this engine to enable it to withstand cylinder pressures well in excess of 1200 lb. per sq. in.

The combustion principles by which operation at such high speeds has been made practicable have been previously covered in these columns (see article by L. M. Woolson, *Automotive Industries*, Dec. 22, 1928). The design assures exceptionally high turbulence of the air during intake and compression (16 to 1 ratio), so as to enable complete combustion of the fuel during the short time available for combustion at this high speed.

A third factor entering into the design of a compression-ignition engine is the necessity of providing fuel pumps and injectors capable of efficient operation over higher ranges of speed than heretofore used in Diesel engines.

These three factors (low weight with high stresses, high turbulence, and increased operating range of fuel pumps and nozzles) are so important in the design of the Packard Diesel that a consideration of the design with direct reference to these factors should first be made.

In analyzing the engine from a weight-stress point of view, it appears that economies have been effected through the

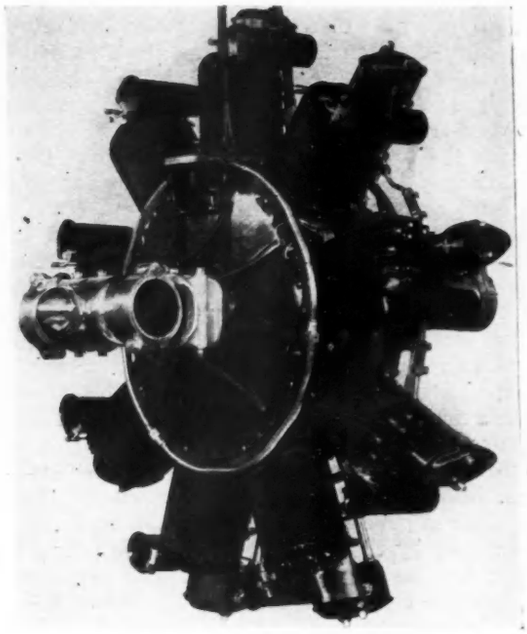


The Packard Diesel cylinder is of the closed end steel type, with an aluminum alloy "head" mainly to provide for valve rocker mounting and port housing

Aircraft Engine at 1900 r.p.m.

builders sets at rest many baseless
standing example of simplification,
gle casting of magnesium alloy

DENHAM



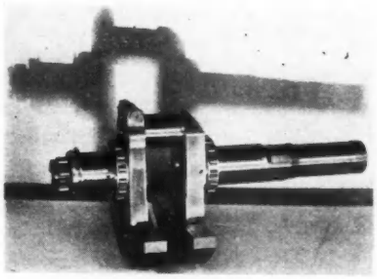
Three-quarter front view of the Packard 225 hp. Diesel, showing the alloy steel rings which serve as cylinder-to-crankcase attachment and are largely responsible for the low weight of this engine

three following general classifications of manufacture:

1. Extreme simplification of structural design.
2. Distribution of normally concentrated stresses.
3. Reduction or cushioning of shock loads.

In a Diesel engine, of course, there are no carburetor and no magnetos, and weight savings result also from the elimination of the exhaust and intake manifolding of gasoline engines. These savings offset the weight of the fuel pumps and injectors with their piping to the fuel-circulating pump by a wide margin. The use of a single valve and actuating mechanism for intake and exhaust also results in a weight-saving simplification.

An outstanding example of simplification is found in the crankcase design. The crankcase proper weighs only 34 lb., and is a single-piece magnesium alloy casting, except for the load-carrying rear web and rear cover. This low weight was made possible by a new method of securing the cylinders to the case. It is a well-known fact that such light-metal structures as crankcases offer little resistance to tensile stresses, while they are well capable of resisting compression. In normal engines, combustion pressures produce tensile stresses, and in the case of the Diesel these would be greatly increased. This is due to the fact that usually the cylinders are bolted to crankcase flanges, and the combustion stresses are transmitted through the hold-down bolts to the crankcase walls.



The Packard Diesel two-piece crankshaft, showing the trunnion mounting of the counterweights

In the Packard, the cylinders are not bolted to the case, but are secured to it by means of circular alloy steel hoops passing over front and rear cylinder flanges. These hoops are provided with turnbuckles. In assembly, these turnbuckles are tightened, contracting them and building up a compressive stress which is nearly uniform all around the case. The contraction of these hoops and, therefore, the compressive stress, is definitely determined within a safe range by the leverage of the special wrench used to tighten the turnbuckle. The primary object of this method is to build up a compression between the crankcase and each cylinder which will exceed by a safe margin the maximum tensile stress which may be imposed on the hoops by the explosion pressure of the cylinder.

Of course, as long as there is a preponderance of compression over cylinder pressure, there will be no tendency for the cylinder to lift off its seat, and unless there is such motion, there can be no increase in the compression at other points of contact of the hoop with the crankcase through other cylinder flanges. Thus, in the design of the crankcase, it was only necessary to give it sufficient strength to resist the initial compressive strains set up by the hoops, since in operation the crankcase stresses are decreased rather than increased.

To enable them to resist the compression stresses, the two main transverse walls which carry the crankshaft main bearings are located directly inside the front and rear hoops respectively. The front transverse wall is part of the crankcase casting, the thrust-and-radial-load bearing at the front end being supported by external radial webs extending to the front of the integral bearing housing. As a rule, the front end of the case of radial aircraft engines is made convex externally to take this load, but this design is not so readily adaptable to the load-resisting requirements found in the Packard Diesel engine.

To take the stress imposed by the rear hoop, a web or diaphragm is piloted in the crankcase, a close fit being maintained between the circumference of this diaphragm and the bored opening in the crankcase. The diaphragm is located in the crankcase against the vertical faces of machined crankcase bosses to which it is fastened by means of studs.

In addition to carrying the crankshaft rear main bearing, the diaphragm also carries the major working parts for the operation of the valves and fuel pumps, which will be described later. It is thus seen that the design of the crankcase results both in simplification

and in the distribution of concentrated stresses.

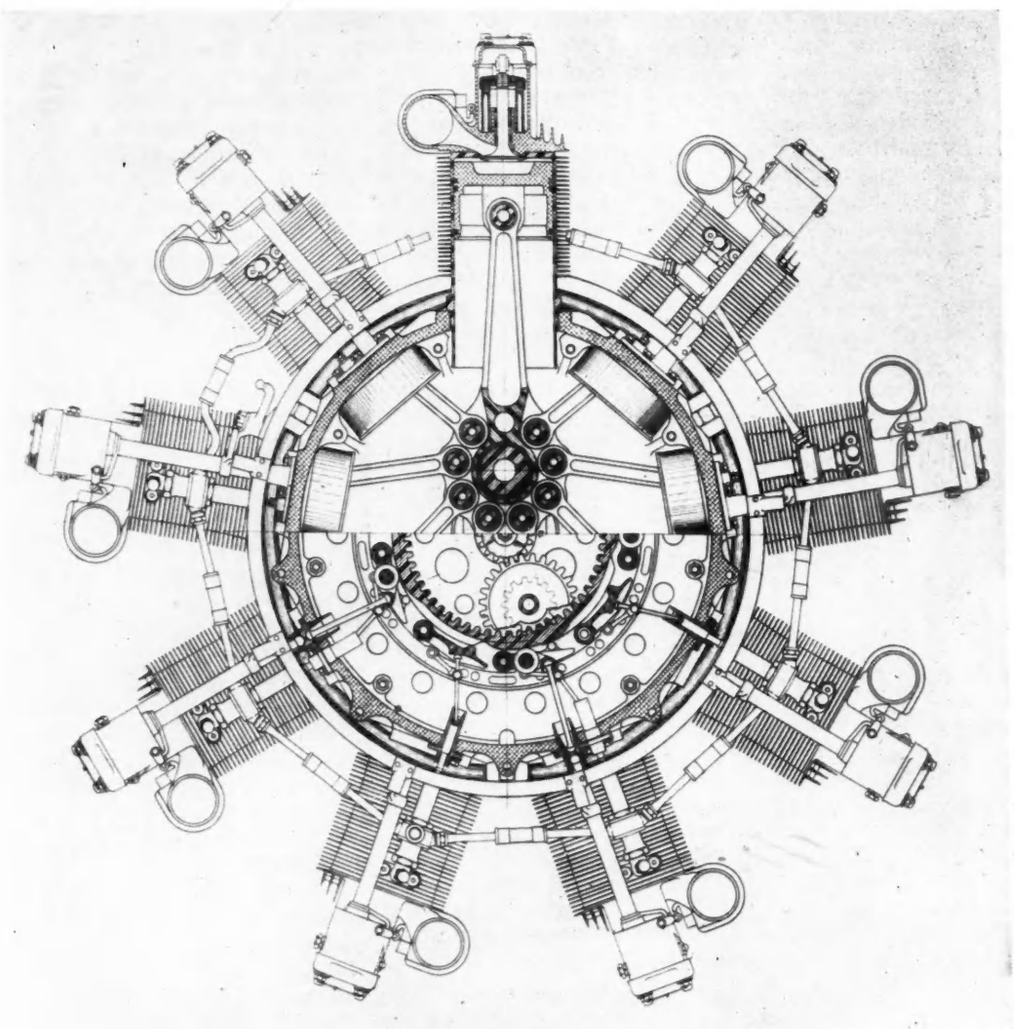
Simplification is again very much in evidence in the cylinder design. Cylinder assemblies are said to weigh only 11¾ lb. each. The cylinders themselves are of closed-end construction, the cylinder head being integral with the barrel, and have integral cooling fins. Bolted to the top of each cylinder is a light aluminum "cylinder head" carrying additional cooling fins, but mainly intended to serve as a means of attachment to the cylinder for the valve rocker box and intake and exhaust ports, these latter being cast in the aluminum head.

To those familiar with the design of air-cooled gasoline aircraft engines, the use of a practically all-steel cylinder with its undoubtedly lower heat-dissipating capacity may suggest rather high head temperatures. As a matter of fact, it is due to the lower head temperatures in a Diesel engine, due to its higher thermal efficiency and consequent lower heat rejection to cylinder walls, that such a design is possible. That wall temperatures generally are lower than in gasoline engines is shown by the observation that the exhaust pipe temperature never exceeds 200 deg. Fahr., and that the maximum cylinder head temperature averages 350 deg. at full throttle. When we consider that the compression pressure alone raises the air temperature to 1000 deg. Fahr., these figures certainly seem very low.

A further item in the line of simplification is the use of a single valve for both the inlet of air and the exhaust of burnt gases. This not only permits using a large valve and reduces the number of parts, but lowers the valve and port temperatures, due to the cooling effect of the intake air. The reliability of the valves and valve gear is emphasized because the time available for opening and closing the valve is increased, permitting lower acceleration. Since the valve remains open from the beginning of exhaust to the completion of intake stroke, it does not have to open and close any oftener than if it served only a single function.

Having thus reduced crankcase and cylinder weight, the next problem lay in the crankshaft and propeller drive. Here the question was largely one of high stress variation. Diesel engine mean effective pressures are of necessity lower than those in a comparable gasoline engine of the same piston displacement, due to the fact that for best fuel economy an excess of air has to be taken into the cylinder to insure complete combustion of the injected fuel. But cylinder maximum pressures in the Packard Diesel, for instance, are ten times as great as the average pressure during the working stroke, a much higher ratio than that found in a comparable gasoline engine, resulting in high accelerating forces on the propeller drive. Since these peak pressures exist for only a comparatively short time, however, the problem resolved itself into cushioning the crankshaft and propeller against these high shock loads.

It is, of course, obvious that if the transmission of the combustion shock load directly to the propeller, through the crankshaft, can be reduced, it would be possible, owing to the decreased torsional crankshaft deflection, to use a much lighter shaft. This has been done in the Packard Diesel by interposing rubber blocks between the propeller hub proper and the driving member at the front end of the crankshaft. In this design, of course, the propeller hub is not rigidly attached to the shaft, but floats on an integral forward extension of the shaft on a bronze bushing. The propeller blade clamp rings are provided with integral lugs which receive the driving effort from a two-armed driving member splined to the crankshaft. A pair of rubber blocks in compres-



Transverse section of the Packard Diesel. Note the injector ports, single air valves, individual fuel pumps with rocker arm operation through push rods and large diameter crankcase

sion are mounted on the ends of these two arms, the driving lugs being secured between the two blocks. In effect, the mounting is equivalent to that of the "shock insulator" used in passenger car spring mounting design, the blocks being confined in such a manner as to be still able to yield elastically.

It is claimed, incidentally, that this design results in a weight-saving in the propeller hub, due to decrease in the shock load for which the latter must be designed. The elastic connection of the propeller to the crankshaft might actually aggravate torsional vibration if it were not for the hysteresis effect of the rubber blocks which tend to damp out vibration. An additional pronounced damping effect on torsional vibration is produced by the flexible mounting of the crankshaft counterweights. The latter are secured to the crank cheeks by means of a central trunnion pin, on either side of which are heavy compression springs. Sudden acceleration of the crankshaft under shock load, therefore, results in rotational displacement of the crankshaft relative to the counterweights with their high flywheel inertia effect. This relative motion is taken up by the compression springs, surface friction aiding the intergranular friction in the springs in damping out any vibratory effect which might be set up. The basic principle, while new to aircraft engine design, has been applied to quite an extent in passenger car engines during the past few years.

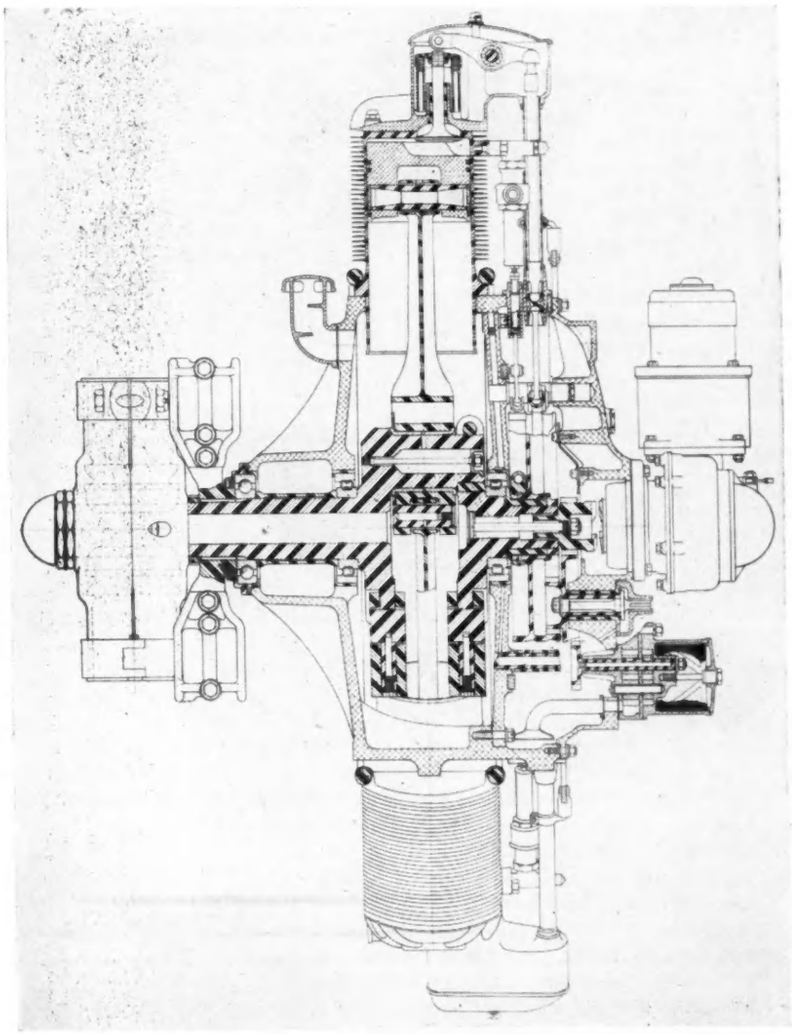
In considering the engine design from the standpoint of combustion, the secret of its high-speed operation is found in the provision of high cylinder turbulence. It must be remembered that in a Diesel engine of the solid-injection type, there is no mixture of fuel and air until the beginning of injection, which corresponds almost with the beginning of combustion. It is obvious that during the brief time available for injection of the fuel charge into the cylinder at such high speeds, the charge cannot fully penetrate the combustion space due to its injection velocity alone. Complete mixture of air and fuel is, however, essential to give efficient combustion. In the Packard Diesel, it is claimed, the problem has been solved by giving the air in the cylinder a whirling motion so rapid that the mass of air will make one complete revolution of the cylinder circumference during the time available for combustion.

This high velocity spiral air motion, it is said, has been obtained by giving the inlet port the form of a flattened venturi tangential to the cylinder bore. The large single valve is advantageous in this respect in that it offers less resistance to the increased air velocity, and also permits a wider venturi passage, resulting in the ability to direct the air into the cylinder at the smallest angle to the horizontal with an overhead valve.

Needless to say, satisfactory results, however, could not have been obtained with this design without a finely atomized and accurately controlled injection of the fuel. The latter practically requires the use of an individual fuel pump for each cylinder. The use of a single central pump, aside from "plumbing" difficulties, is characterized by a time lag between pump action and injection not easily susceptible of control. In the Packard Diesel the Dorner pump and nozzle are used, the two parts forming practically a single unit, with the pump discharging almost directly into the nozzle, the entire assembly being bolted, by means of two studs and nuts, to a flange on the rear side of the cylinder.

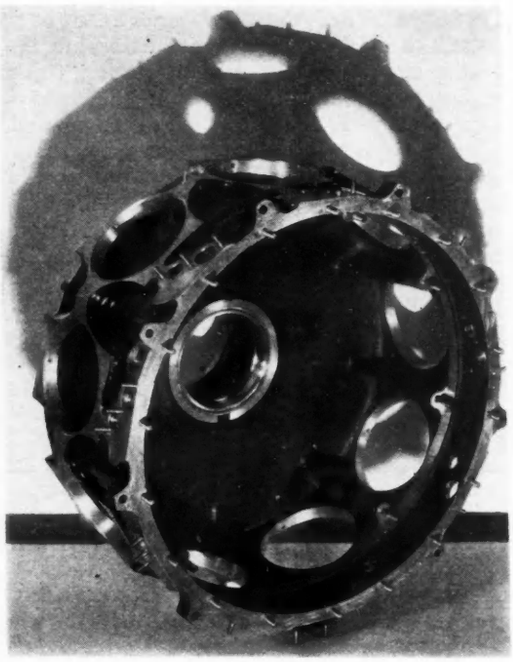
The basic design has been previously described in these columns (see *Automotive Industries* of Dec. 7, 1929, p. 823), but while the principle of operation then given has not been altered, some details have been changed and improved, although exact information as to these changes is still being guarded by the Packard Motor Car Co.

Briefly, the pump and nozzle consist of a readily detachable unit to which fuel is supplied through integral screen housings at low pressure. The pump consists of an extremely accurately fitted plunger in a bronze cylinder operated by a variable-stroke push rod from a cam ring in the crankcase. There is also an adjustable tappett at the plunger connection for the factory setting of the plunger to the correct height in relation to the fuel-intake port. The pump plunger has a mushroom head which engages a T-slot in a cross-head or guide which in turn contacts with the fuel-pump tappet. A compression spring surrounds the pump cylinder, within the housing, to return the pump plunger at the end of the stroke.



Longitudinal section, Packard Diesel engine, showing the rubber block mounting for the propeller drive, trunnioned crankshaft counterweights and load-carrying crankcase "diaphragm" (at the rear bearing)

Clamped between the fuel-pump body and the nozzle body is a one-way ball check valve assembly. The nozzle body, like the pump body, is an alloy-steel forging, the two being screwed together with a lapped joint between them. The injector itself is a separate assembly which is screwed into its housing and consists of a flared-end nozzle in which is seated a small poppet valve, or, rather, inverted needle valve. The latter is fitted with a a compression spring arranged to hold the valve seated, not against the nozzle opening, but against an independent adjustable screw stop located at the rear of the nozzle body. This stop is so adjusted as to hold the valve off what would normally be its seat on the nozzle by an amount equivalent to only a few thousandths of an inch. The fuel is injected through this narrow aperture, this design being said to give excellent atomization. It also is claimed to be free from carbon-forming propensities, as well as offering a ready means of escape for any air trapped in the fuel.



The simple one-piece main crankcase casting is notable for its ease of machining. Its light weight is due to the elimination of major tension stresses in engine operation

A further means of washing air out of the fuel system is provided by the rapid circulation of the fuel through the supply system at low pressures, with complete return to the fuel tank, the latter being vented to the atmosphere.

Since in a Diesel engine the only factor which has to be changed to vary the power output or engine speed is the amount of fuel injected by the pump, it is only necessary to provide a method of varying the length of the stroke of the plunger above the pump inlet port. Changing this stroke in the Packard Diesel is effected through a rocker arm design which incorporates a method of varying the leverage on the push rod, and, therefore, the stroke of the latter. The rocker arms themselves are pinned to the crankcase diaphragm and are actuated by a four-lobe cam ring driven at one-eighth engine speed. The inner ends of the fuel pump push rods rest in specially formed grooves or channels provided in these rocker arms. The push rods, furthermore, are connected by a linkage near their inner ends to a circular control ring mounted in a groove on the crankcase diaphragm, the movement of this ring through its relatively small arc of action being controlled through a tapered roller and yoke by an externally mounted lever connected to the pilot's cockpit.

Drive to Cam Ring

The cam ring and rocker arm anchor pins also carry the four-lobe cam ring and rocker arms for the single valves in each cylinder. Drive to this cam ring is through an internal gear machined on the ring, and a compound idler meshing with the crankshaft gear, so that rotation is opposed to that of the crankshaft.

The rocker arm anchor pins are chamfered at their outer ends, and steady rest bearings are provided for them in the rear crankcase cover. The rocker arms themselves are located endwise between an integral shoulder on the shaft at the inner end and a shouldered bushing held in place by a cap screw at the outer end. By this means, the rocker arms can be assembled on the crankcase diaphragm before the later is assembled into the crankcase. It will be noted that push rods are actually in two pieces, with plungers fitted in forged duralumin guides between them, the guides being bolted to the finished surfaces on the outside of the crankcase.

While no means is incorporated for automatically taking care of the valve tappet adjustment with expansion due to heat, the engine, in this respect, following customary radial engine design, it is pointed out that cylinder expansion provides an automatic compensating action on the fuel pump, since the tendency is to decrease the pump plunger stroke with an increase in temperature. This decrease is claimed to be practically in proportion to the decrease in volumetric efficiency occasioned by the increased cylinder temperature.

While the control ring regulating the fuel pump stroke is the only control necessary for usual operating conditions, it has been found that better idling is obtainable through the provision of shutter valves located in the air intake, effective in decreasing the amount of fresh air drawn in. These shutters are operated by fore-and-aft connecting rods connected by a ball joint to the air valve push rod tube. These tubes are fitted with ball-jointed levers at their inner ends, engaging sockets which are riveted to a control ring supported from the crankcase mounting bosses and operated in conjunction with the throttle, so that for idling purposes the front ports of the cylinder head are substantially closed, and all air drawn into the cylinder comes from the exhaust manifold.

"Glow Plug" Starter Used

There has been considerable discussion recently as to the probable method of starting used on the Packard Diesel. While considerable experimentation was carried out with lightweight starters, using 12-gage shotgun shells, inability to secure sufficiently uniform shells in general distribution led to the abandonment of this type, mentioned by L. M. Woolson at a recent S.A.E. meeting, in favor of the conventional inertia starter. In the course of starter development work it was also found that satisfactory starting with reasonable expenditure of cranking effort could not be obtained with the Diesel at below-zero temperatures without the aid of some external source of heat.

An incandescent electric heating element, or "glow plug," was finally adopted. These plugs, it is said, are required only at low temperatures, but they are made a regular equipment on the engine.

Mention remains to be made of some design details not referred to previously because they have no direct relation to the Diesel principle. Valve rocker boxes are slanted into the propeller slip stream to reduce the drag effect. Valve tappet clearance adjustment is by rotation of the eccentric shaft carrying the roller bearing

on which the valve rocker arm rides. Tappets are adjusted close when cold, and then give 0.015 in. clearance when hot. Valve springs are of the multiple type used on other Packard aircraft engines. Crankshafts are of the two-piece type, with one-piece master rod and normal design link rods. Crankshaft bearings are also arranged in the conventional manner, with a combination radial load and thrust bearing in the nose, a roller bearing behind this, and another roller bearing at the rear of the shaft.

Pistons are characterized by a peculiarly shaped head, being recessed at one side for valve clearance and fuel injection, so that the major part of the combustion chamber at the top of the stroke is evidently contained within this piston depression. The design is said to aid in producing additional turbulence. There are three rings, two compression rings above the pin, and an oil scraper below. Piston pins are of floating design with expanded aluminum plugs in the pin ends.

Lubrication System

Accessories are mounted on the rear crankcase cover, and consist of the lubricating and fuel oil circulating pumps, starter, generator and tachometer drives. Engine mounting bosses are on the crankcase casting proper. In general, the lubricating system does not differ from the usual aircraft engine practice. There are no oil pipes inside the engine, nor are there any drilled passages in the main crankcase casting itself. Oil enters through one of the rocker arm pins, and is distributed to the valve and pump operating mechanism through radial holes drilled in the crankcase diaphragm. There is a floating oil ring at the cam ring hub which provides the oil lead to the crankshaft, connecting rod bearings being lubricated from there in the usual manner. There are also drilled oil leads to the counterweight pin bushings. Lubrication of the accessories drives is through holes drilled in the rear crankcase cover. Anti-friction bearings, piston pins and cylinder walls are lubricated by splash. Rocker arms have pressure-gun fittings.

Some additional facts about this engine may be of interest. The 16 to 1 compression ratio produces a compression pressure of approximately 500 lb. per sq. in., raising the temperature to about 1000 deg. Fahr. The fuel pump plunger begins to rise at approximately 45 deg. before top dead center, and continues to almost top dead center, depending on the "throttle" setting, the cut-off being earlier for low engine speeds. The valve opens again at 45 deg. before bottom dead center, and the exhaust passes out through the single port into the collector at the rear of the cylinders. The air intake being in line with the beginning of the exhaust piping, some fresh air is sucked into the exhaust manifold by the vacuum produced by the inertia of the column of exhaust gas, the fresh air assisting in cooling the manifold. The valve remains open through the inlet stroke, closing shortly after bottom dead center of this stroke.

To stop the engine it is merely necessary to close the throttle completely against a spring stop, this extra motion restricting the fuel pump stroke so that it no longer injects fuel into the cylinder. In starting, the throttle is opened wide. Domestic furnace oil is the fuel that is generally most satisfactory. This has a specific gravity of approximately 37 deg. Beaume, and a pour test of around minus 40 deg. Fahr.

With respect to altitude flying, Packard states that in its test flights with Stinson and Waco planes, altitudes of over 18,000 ft. have been reached with no effect on engine operation except an increase in revolutions for a given throttle setting.

Combustion With Overload

One phase of Diesel engine operation which requires some explanation is the so-called overloading condition. In order to secure complete combustion and the low specific fuel consumption obtainable, an excess of air (around 25 per cent in the Packard Diesel) is required. However, where additional power is desired for brief intervals, as in taking off or climbing, it is quite permissible to inject an extra amount of fuel into the cylinder to combine with nearly all of the excess air, and while combustion under these conditions will not be as complete as normally, a gain in power is obtainable at a sacrifice in fuel economy.

While no actual fuel consumption figures are given out, it is stated that the gain is in the neighborhood of 20 per cent by weight and 30 per cent by volume compared with similar gasoline engines. From other sources it has been learned that a specific fuel consumption of around 0.35 to 0.37 lb. per hp. per hr. at full throttle and rated speed has been found easily obtainable.

Refinement of Brinell Hardness Tests

IT has been found that when making Brinell hardness tests of metals the results obtained depend upon the hardness of the steel balls used in making the tests. An investigation of the dependence of Brinell readings on the hardness of the measuring balls has been made for the British Engineering Standards Association at the National Physical Laboratory of England and the results are given in a recently published report by R. G. Batson and S. A. Wood. As a result of the findings the following recommendations in connection with hardness tests are made by the authors:

It is suggested that a static diamond hardness indentation test should be included in the British Standard Specification as a hardness test for balls. The corrected diamond hardness number of balls used for Brinell testing up to a Brinell number not exceeding 500 should not be less than 900. For Brinell tests on material with a Brinell number exceeding 500 and less than 630, work-hardened balls should be employed, the results having shown correspondence between the Brinell and diamond hardness figures up to that Brinell value, but failure in the Brinell test to give adequate values on material of higher hardness. This failure is ascribed to the permanent deformation of the ball, and for materials of such hardness the diamond indentation or other suitable tests should be used. Where a diamond hardness testing machine is not available, the ball-flattening test may be applied for 10 mm. and 5 mm. balls, with a minimum value of 600 kg. per sq. mm. for 5mm. balls and 630 kg. per sq. mm. for 10 mm. balls.

As a rough indication of surface hardness, it may be taken that the corrected diamond hardness number of a ball that can be scratched by a new smooth file is probably below 850.

Maintenance Expense in Germany

Prospect of improved sales of Amer last two years is not bright, less taxes and operating charges. Cars

By EDWIN

GERMANY, although it has the largest population (64 millions) of all European countries with the exception of Russia, has not even half as many automobiles as the United Kingdom (48 millions) or France (40 millions) and yet she is primarily an industrial nation and has an extensive and passably good system of public roads. This is because she is a comparatively poor nation and in an unhealthy economic position. It is true that the standing army has been reduced to one-eighth of its pre-war status, the navy expenditures are no longer of any great importance, and no air force has to be kept up, yet the taxation per head of the population and per annum has grown from 90 goldmarks (calculated at present gold price) to 210 goldmarks—not counting the enormously increased levies for social welfare work.

During 1929 car registrations increased by about 70,000 and registrations of commercial vehicles by 21,000. About 30,000 old cars and trucks, it is estimated, were junked, so that the number of new vehicles of both classes actually sold to the German public amounted to about 130,000.

If the outlook for future business be considered, it is not very promising, and it does not seem likely that in the next few years any considerable improvement will take place. For the American type car, indeed, the prospects of sales being increased beyond what they have been the last two years are poor, and this less for reasons of initial cost than on account of their maintenance expenses in Germany. In that country, taxes are still being levied on piston displacement in the case of passenger cars, and on net weight in that of commercial vehicles. Naturally, small passenger cars up to about 60 cu. in piston displacement and light speed-trucks with a carrying capacity up to about 1½ tons (developed from passenger car chassis) sell in the largest numbers.

German Passenger Car Growth

Registration		
1929	**1928**	**1927**
458,060	387,700	298,600

Production		
1929	**1928**	**1927**
116,700	108,000	60,000

But maintenance cost is an even more decisive factor with German buyers than the tax. In a city like Berlin, even a small car of only 45 cu. in. displacement costs about $35 a month, including depreciation, and can be afforded only by a man who earns at least 600 marks a month. The overwhelming majority of employees, however, earn much less than this sum. The purchase price in many cases is not an insuperable obstacle, because people of this class generally could afford the price of a larger car.

There are four makers in Germany catering for this market, viz.: Opel, BMW, DKW and Hanomag, and they can easily meet the demand. The DKW is a small two-cylinder, two-stroke model of 30.5 cu. in. displacement. It is the smallest car in this regard in Germany and costs the least for taxes. It has good performance and is attractive in appearance. The BMW and Hanomag each have 46 cu. in. engines, and the former at least, which is being built in Germany under Austin license, is very popular. The small Opel has a 61 cu. in. engine and stands in great favor because it will accommodate four persons. Under G.M.C. control, its price has been reduced to approximately $450, and it is, therefore, cheaper than the other small cars mentioned, while the tax is only slightly greater than for the others.

Unfortunately, no production figures are issued for German manufacturers. The total production of passenger cars for 1929 has been given out as 116,700, of which approximately 26,000 came from assembly plants of foreign manufacturers. Thus, the German industry must have turned out approximately 90,000 cars.

Production of Small Cars

The makers of small cars between them will produce approximately 35,000 cars, of which number a goodly proportion was produced for stock during the winter months. Of this number, BMW, DKW and Hanomag will produce about 8000, 7000 and 3500, leaving 16,500 for Opel. The Brennabor works, next to Opel the largest German producer of passenger cars, also build what might be classed as small cars. But their model has a 91½ cu. in. four-cylinder engine and is far more pretentious and expensive. This firm also produces 150 and 183 cu. in. cars, both with six-cylinder engines and ranging in the $1,500 class. Altogether this maker turned out about 11,000 cars in 1929. Opel in its other lines, including a 122 cu. in. six-cylinder selling at about the price of the Chevrolet and Ford, produced an additional 13,500 cars, making a total of 30,000 cars for the year. This is the largest output of any factory in Germany. The next largest producer in point of numbers is the General Motors assembly plant at Berlin, which turned out approximately 12,000 passenger cars during 1929. The only other large assembly plant of note in Germany is that of the Ford Motor Co., which produced about 8000 passenger cars.

Returning to the purely German works, we find that Daimler-Benz must have turned out about 9000 cars. As its lowest-priced model costs about $1,500 and the prices of other models rise to about $8,000, the turnover must have been quite satisfactory. Adler, Horch, Stoewer, N.A.G., N.S.U., Rohr and Wanderer between them accounted probably for about 19,000 to 20,000 cars, while the remaining four of the 17 German manufacturers, Maybach, Audi, Hansa-Lloyd and Simson, produced from 2000 to 3000 cars between them.

In the commercial car field the production was 33,300 units, of which about 9000 were turned out from Ford

Hampers Automotive *Industry*

ican type car beyond the total of the for reason of initial cost than for of small displacement most popular.

P. A. HEINZE

and General Motors assembly plants. During the past two years, a distinct tendency in this line has become manifest, buyers favoring the speed trucks and vans of 1½ to 2 tons capacity and the very heavy vehicles which have a large capacity and are capable of hauling one or more trailers. For tax reasons the commercial vehicles in the statistics are classified by weight.

It will be seen in the accompanying table that the 6600-12,000-lb. class actually lost more than 1400 registrations while the heavier class gained more than 2200 units.

The American vans and trucks sold in Germany are of the type weighing up to 4400 lb. and in this class there has been an increase in registrations of 15,640. As General Motors and Ford together account for about 9000, there remain 6640 which were produced mainly by Opel and Brennabor. Altogether, some 20,000 of the first two classes were manufactured, leaving roughly 13,000 for the heavier classes. These were built by Buessing, Daimler-Benz, DAAG, Hansa-Lloyd, Henschel, Kommick, Krupp, MAN, Nacke, NAG and Vomag.

Bus Registrations Increase

Bus registrations increased by about 2000, the main suppliers of these having been Buessing, Daimler-Benz, N.A.G., Magirus, Vomag and DAAG.

In 1924, when the currency was stabilized after the inflation, German manufacturers completely reorganized their plants in accordance with American methods of mass production. For this they used borrowed money. Few of these makers had models that really were ripe for mass production and fully tested out so as to warrant production in large series. Besides, most of them greatly over-rated the capacity of the German market. The result was that a number of factories became involved in financial difficulties. In addition, the import duties came down year by year, and German dealers, many of whom were not on the best of terms with the manufacturers because of the arbitrary methods of the latter during the inflation period, began to turn their attention to the sale of foreign cars. Moreover, assembly plants began to grow up and compete with the German industry. All these circumstances serve to explain the German industry's losses and its present precarious financial situation. Only 17 manufacturers of passenger cars remain, out of about four times that number, and these for the most part have had difficulty in making ends meet during the past few years. It is not unlikely that more will disappear.

Opel has been the most successful of the makers who adopted mass production along American lines, but this firm may have built too many different models. This, probably, was the cause of the owners being forced to look for help and to join in with General Motors, which combine, as will be recollected, acquired 80 per cent of the capital stock. Since then the manufacturing program has been pared down to two models of 61 and 122 cu. in. displacement, the latter a six. Both cars are well suited to the German market, and General Motors undoubtedly showed good judgment in concluding the Opel deal, for now it has a basis for operation in Germany wholly independent of tariff considerations.

If the German industry should succeed in inducing the government to control imports on a quota basis, as proposed jointly by all European makers, which might make it necessary to curtail operations at the Berlin assembly plant, the combine would still hold a commanding position in Germany by reason of its control of the Opel plant. It appears that Ford has been preparing for this eventuality too, for the new assembly plant under construction at Cologne may be converted into a full manufacturing unit.

But whether the agitation of the German industry will have the desired effect cannot be foretold at the moment. Many influential politicians seem to favor the quota scheme, but, of course, the last word lies with the German Diet. In this connection it is worth mentioning that the general situation with respect to foreign trade in automotive parts and vehicles is not quite as bad as German makers present it. Business is stagnating at present, but it is perhaps less the assembly plants and the imports that are the cause of the unsatisfactory state of the automobile business than the generally bad economical situation.

German exports of passenger cars increased in value from 26,600,000 marks in 1928, to 32,280,000 marks in 1929, or by more than 21 per cent. The number of cars exported increased only 5 per cent, from 4578 to 4809. In the truck field the number of units exported dropped slightly, but the value of the truck exports rose from 20,980,000 to 23,450,000 marks.

Imports of complete cars receded during 1929 for the first time. The number of cars entering Germany in 1928 was 17,819 and their value was 70,740,000 marks. In 1929 the number decreased to 14,529 and the value to 47,720,000 marks. Considering the increased value of the exports and the reduction in the imports, the German industry in 1929 gained about 31,000,000 marks of business—which is not to be despised.

German Commercial Vehicles Registered July 1, 1929

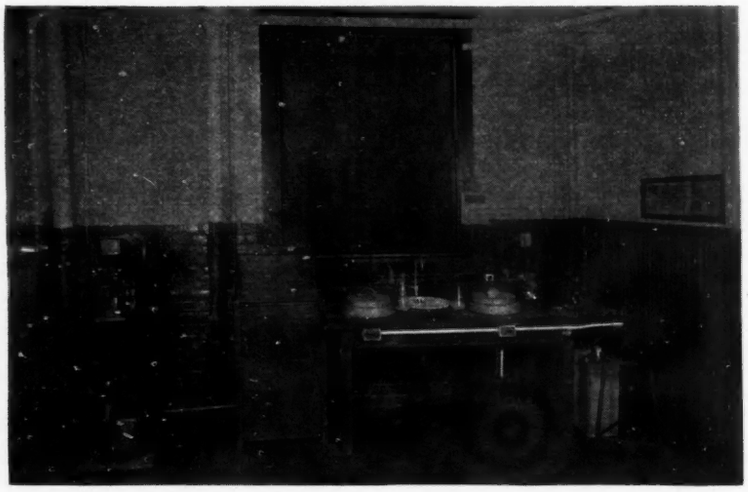
Net Weight Up to:	Capacity Approx.:	1927	1928	1929
2,200 lb.	½-¾ ton	12,834	15,971	18,015
4,400 lb.	1-ton	30,964	43,539	59,179
6,600 lb.	2-4 tons	10,101	13,435	17,093
8,800 lb.	4-5 tons	19,029	18,305	17,746
12,000 lb.	6-6½ tons	25,361	25,511	24,647
Above	above	2,680	5,004	7,272
Totals		**100,965**	**121,765**	**143,952**

Metallurgical *Laboratory* of the *Combines* Scientific Research

Variations in raw materials, poten turing procedure and many other by means of the coordina

By JOSEPH

COMBINING the functions of scientific research and the control of related manufacturing processes, the metallurgical laboratory of the Timken-Detroit Axle Co. exemplifies the ideal linkage of the modern laboratory and the production processes which it standardizes and closely controls. H. W. McQuaid, nationally known metallurgist, and the guiding spirit behind the Timken laboratory, is ex officio superintendent of the heat-treating departments throughout the plant, and is virtually in control of the actual manufacturing operations within these departments. Thus, the foremen of the heat-treating departments come to the laboratory for advice on the problems which continually



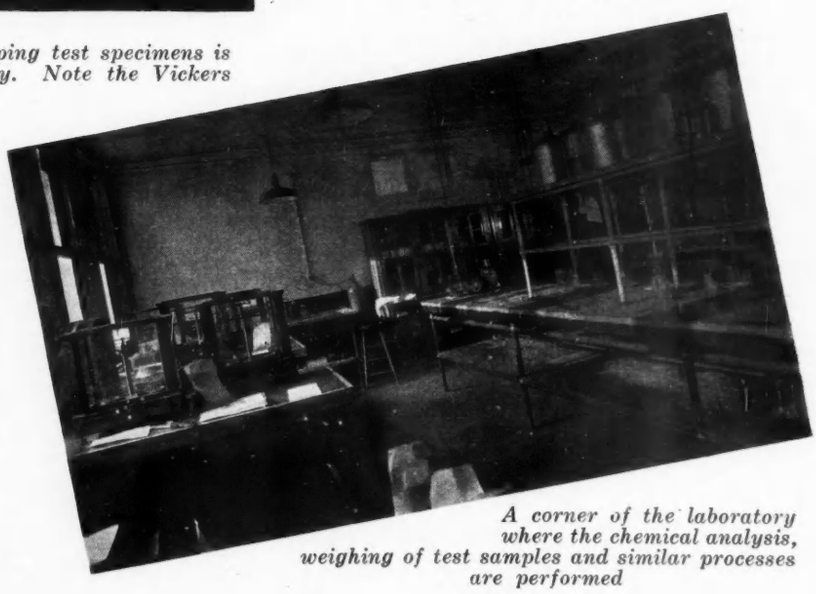
The work bench for polishing and lapping test specimens is situated at the rear of the laboratory. Note the Vickers hardness testing machine at the left

occur during the course of the day. Potentially serious difficulties in procedure and in many other details, as well as variations in raw materials, accordingly are smoothed out with facility and, as a matter of routine, frequently without any interruption to production.

The activities of this laboratory are manifold and include many widely separated details. For example, the steel specifications for any new or contemplated design originate here, as do the standard specifications for the heat-treatment of these steels. In a similar manner, the laboratory writes the standard specifications for the other varied raw materials, such as lubricating oils, cutting oils, quenching oils, plating materials, cleaning materials and carburizing materials. Naturally, the specification is predicated on a detailed scientific study of the requirements of each case and involves a critical production test of competitive products.

To cite one instance, a study of carburizing materials extended for a period of almost a year and involved the testing of carloads of various types of carburizing material supplied by different sources. The final result gave them invaluable information and crystallized a definite knowledge of carburizing materials for their requirements. The selection of other raw materials, some of which already have been enumerated, is accomplished in the same fashion and results in standard specifications.

Definitely established specifications are then filed with the purchasing department and constitute a rigid basis on which all purchases are made. In this connection the purchasing department cooperates with the laboratory in considering competing commercial sources against these specifications. And finally, the laboratory guards the product



A corner of the laboratory where the chemical analysis, weighing of test samples and similar processes are performed

Timken-Detroit Axle Company and Production *Control*

tially serious difficulties in manufac- details smoothed out as routine tion and supervision of unit

GESCHELIN

at the source by routine-inspecting all incoming raw material.

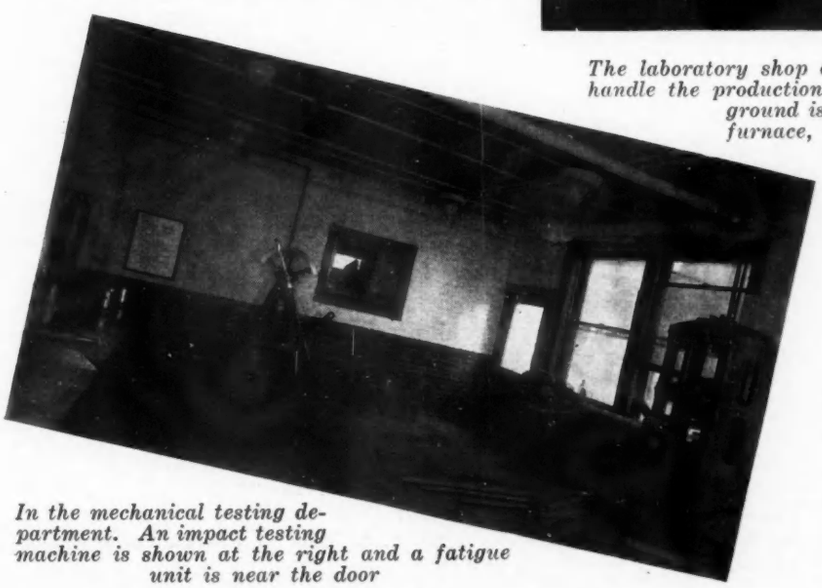
In the manufacturing establishment the supervisory control extends to the various heat-treating departments, the forge shop and the plating and cleaning departments. In the heat-treating department routine procedure is established, facilitating production within the limits of the standard specifications. With the heat treatment are associated the related operations of normalizing and annealing, all of which contribute to the quality of the finished part. Among other things, the laboratory controls and checks the measuring and recording instruments used in these departments and keeps an accurate check on the condition of the furnaces and other major items of equipment.

In the forge shop the control problem is somewhat simpler, as they are concerned chiefly with the measurement of maximum temperatures. On the other hand, the finished forgings demand careful inspection due to the nature of the process and the critical effect of variations in raw materials and temperature.

Plating, cleaning and pickling departments present another aspect of the problem. Here it is necessary to specify the procedure, the character of the chemicals and the composition of the mixtures that are used. Again the laboratory is consulted constantly and is expected to recommend the mechanical equipment, such as ovens, furnaces, tanks, heating equipment, etc.

Responding to the demands of an ever-increasing responsibility, the facilities of the laboratory have been expanded into larger quarters in a one-story building recently rebuilt for the purpose. The entire forward part of the building, fronting Clark Street, is devoted to the chemical laboratory, completely equipped for qualitative and quantitative analysis. A small machine shop, equipped with a drill press, grinder, saw and other miscellaneous tools, prepares samples for analysis and mechanical testing. An interesting piece of equipment in this department is a small Hevi-duty electric furnace with magnetic control used for heat-treating test specimens.

The laboratory shop at Timken-Detroit is well equipped to handle the production problems of the plant. In the background is shown the small electric heat-treating furnace, which is among the notable features of equipment



In the mechanical testing department. An impact testing machine is shown at the right and a fatigue unit is near the door

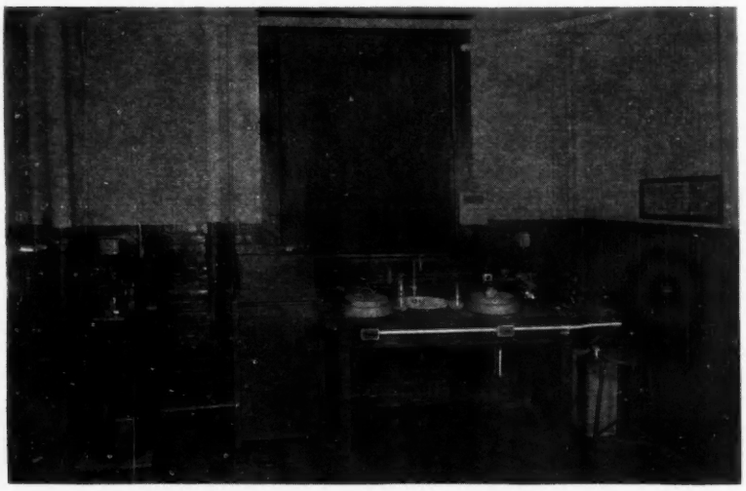
Another corner of the laboratory contains the dark room and complete equipment for micro-photographic work. One-half of the rear part of the building adjoining the office contains a number of hardness testing machines and a work bench with a surface grinder

Metallurgical *Laboratory* of the *Combines* Scientific Research

Variations in raw materials, poten turing procedure and many other by means of the coordina

By JOSEPH

COMBINING the functions of scientific research and the control of related manufacturing processes, the metallurgical laboratory of the Timken-Detroit Axle Co. exemplifies the ideal linkage of the modern laboratory and the production processes which it standardizes and closely controls. H. W. McQuaid, nationally known metallurgist, and the guiding spirit behind the Timken laboratory, is ex officio superintendent of the heat-treating departments throughout the plant, and is virtually in control of the actual manufacturing operations within these departments. Thus, the foremen of the heat-treating departments come to the laboratory for advice on the problems which continually occur during the course of the day. Potentially serious difficulties in procedure and in many other details, as well as variations in raw materials, accordingly are smoothed out with facility and, as a matter of routine, frequently without any interruption to production.

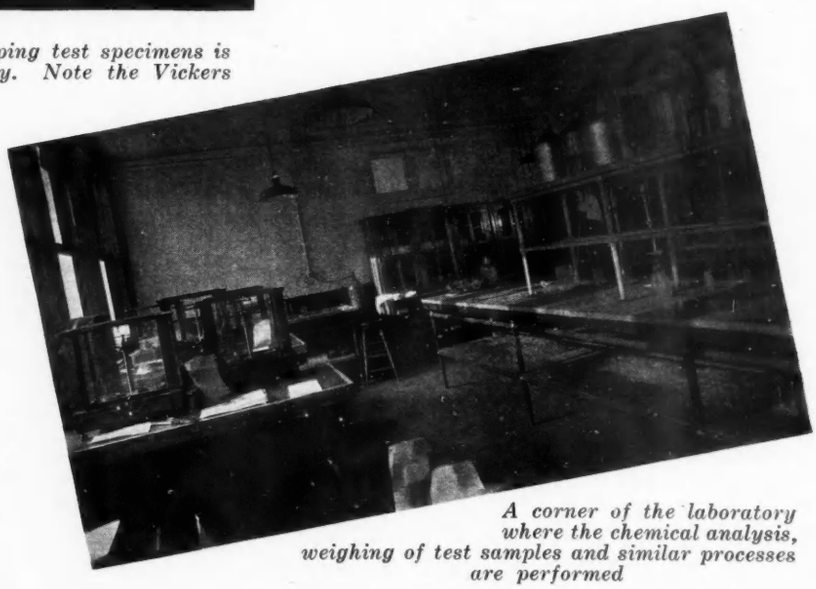


The work bench for polishing and lapping test specimens is situated at the rear of the laboratory. Note the Vickers hardness testing machine at the left

The activities of this laboratory are manifold and include many widely separated details. For example, the steel specifications for any new or contemplated design originate here, as do the standard specifications for the heat-treatment of these steels. In a similar manner, the laboratory writes the standard specifications for the other varied raw materials, such as lubricating oils, cutting oils, quenching oils, plating materials, cleaning materials and carburizing materials. Naturally, the specification is predicated on a detailed scientific study of the requirements of each case and involves a critical production test of competitive products.

To cite one instance, a study of carburizing materials extended for a period of almost a year and involved the testing of carloads of various types of carburizing material supplied by different sources. The final result gave them invaluable information and crystallized a definite knowledge of carburizing materials for their requirements. The selection of other raw materials, some of which already have been enumerated, is accomplished in the same fashion and results in standard specifications.

Definitely established specifications are then filed with the purchasing department and constitute a rigid basis on which all purchases are made. In this connection the purchasing department cooperates with the laboratory in considering competing commercial sources against these specifications. And finally, the laboratory guards the product



A corner of the laboratory where the chemical analysis, weighing of test samples and similar processes are performed

Timken-Detroit Axle Company and Production *Control*

tially serious difficulties in manufac- details smoothed out as routine tion and supervision of unit

GESCHELIN

at the source by routine-inspecting all incoming raw material.

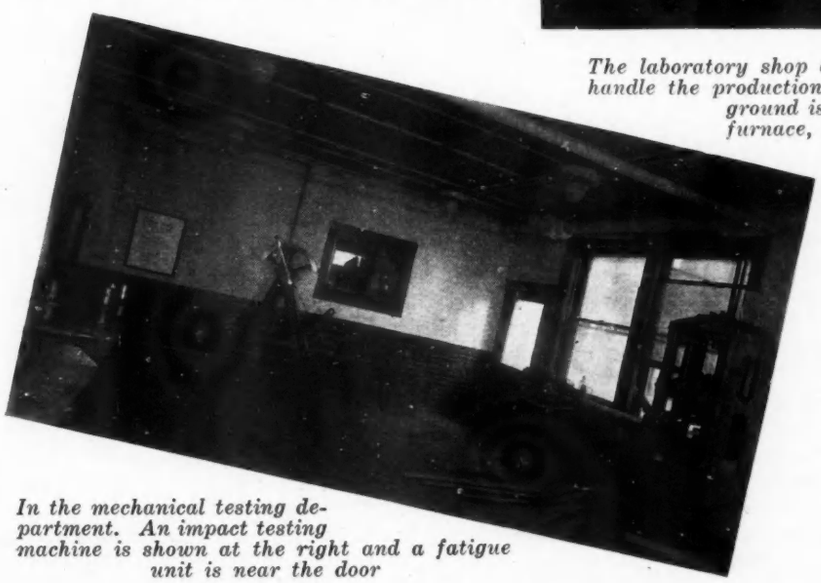
In the manufacturing establishment the supervisory control extends to the various heat-treating departments, the forge shop and the plating and cleaning departments. In the heat-treating department routine procedure is established, facilitating production within the limits of the standard specifications. With the heat treatment are associated the related operations of normalizing and annealing, all of which contribute to the quality of the finished part. Among other things, the laboratory controls and checks the measuring and recording instruments used in these departments and keeps an accurate check on the condition of the furnaces and other major items of equipment.

In the forge shop the control problem is somewhat simpler, as they are concerned chiefly with the measurement of maximum temperatures. On the other hand, the finished forgings demand careful inspection due to the nature of the process and the critical effect of variations in raw materials and temperature.

Plating, cleaning and pickling departments present another aspect of the problem. Here it is necessary to specify the procedure, the character of the chemicals and the composition of the mixtures that are used. Again the laboratory is consulted constantly and is expected to recommend the mechanical equipment, such as ovens, furnaces, tanks, heating equipment, etc.

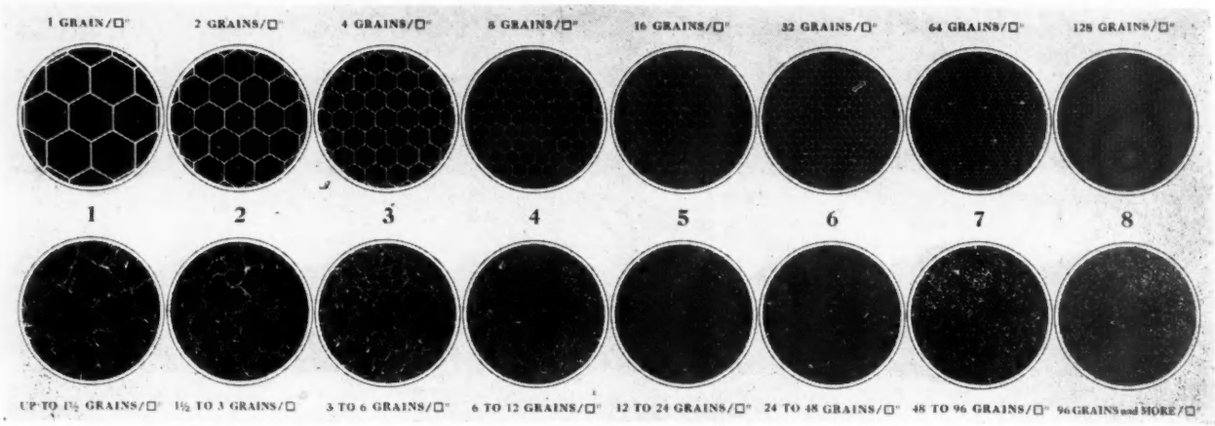
Responding to the demands of an ever-increasing responsibility, the facilities of the laboratory have been expanded into larger quarters in a one-story building recently rebuilt for the purpose. The entire forward part of the building, fronting Clark Street, is devoted to the chemical laboratory, completely equipped for qualitative and quantitative analysis. A small machine shop, equipped with a drill press, grinder, saw and other miscellaneous tools, prepares samples for analysis and mechanical testing. An interesting piece of equipment in this department is a small Hevi-duty electric furnace with magnetic control used for heat-treating test specimens.

The laboratory shop at Timken-Detroit is well equipped to handle the production problems of the plant. In the background is shown the small electric heat-treating furnace, which is among the notable features of equipment



In the mechanical testing department. An impact testing machine is shown at the right and a fatigue unit is near the door

Another corner of the laboratory contains the dark room and complete equipment for micro-photographic work. One-half of the rear part of the building adjoining the office contains a number of hardness testing machines and a work bench with a surface grinder



Grain size classification chart used at the Timken-Detroit Axle Co. laboratory

and lapping wheels for preparing steel specimens for the microscope.

A number of essential pieces of mechanical testing equipment are found here, among which are a fatigue testing machine and an impact testing machine. In addition, they have a Riehle tensile testing machine and a Vickers hardness testing machine. By the way, it might be of interest to note that just a short time ago this was the first Vickers hardness testing machine to be found in a laboratory in the United States. In fact, it was the only one in this country for a year, during which time special samples were checked on it for a number of other experimental laboratories.

This machine, as is well known, utilizes a diamond point capable of measuring the high hardness occurring in nitriding operations.

Another interesting piece of equipment is a new testing machine just received from England. This is a magnetic crack indicator, which indicates breaks in the surface of a piece of steel. As in the case of the Vickers machine, the magnetic crack indicator is probably one of the first, if not the only machine of its kind in this country at the present time. It consists essentially of a large induction coil, serving as an electro-magnet of high inductive capacity with its poles terminating in steel side pieces having "vees" to hold the steel specimen. Current to the apparatus is controlled by a sliding contact potentiometer type rheostat.

In operation, a test specimen is laid on the V-block, the coil is energized and the specimen is painted with a special oil solution containing electrolytic iron in suspension. Magnetic lines of force moving along the surface of the specimen are interrupted by the reluctance of the air gap formed at the crack and are forced to deflect outwardly from their path. The resulting tension in the magnetic field draws together the iron particles adjacent to the crack and sets them up in a comparatively heavy band along the crack. By this means the exact location and configuration of the crack are immediately evident. This equipment is of especial value in determining the presence of fatigue cracks in such parts as steering knuckles, etc.

H. W. McQuaid and his associates have been especially prolific in research activities dealing with new developments in the metallurgical art and in other cases aimed at a solution for problems arising in production. For example, they were the first to determine the connection between the carburized structure of a steel and some of the troubles which are common to heat-treating and machining practice. They have found that a definite relationship exists between the structure as shown by the so-called McQuaid-Ehn test and the results in heat-treating of steel, and the ductility, as well as the machinability. This test has become a recognized check in this country in addition to the usual chemical specifications, especially for steels used in the automotive industry. The grain size chart shown above is issued by one of the steel companies to be used in comparing the results of the McQuaid-Ehn test.

Much of the final results of their research work is made available to other investigators through the medium of the several technical societies.

The intimate linkage of the laboratory and the manufacturing plant is productive of valuable results. On the one hand, it provides a skilled staff which closely controls certain important elements of the production process, thus aiding in the reduction of waste, inspection losses and tie-ups in production. On the other hand, it keeps abreast of new developments in the art, enabling the manufacturing plant to take advantage of any new materials and processes that offer some advantage in cost or in the quality of the finished product.

SPAIN PRODUCES AN EIGHT

(Continued from page 537)

71.3 by 100 mm., built as a normal chassis and also as a sports model with a supercharger.

Advanced design is found in the engine and chassis and by the use of aluminum, duralumin, magnesium, and other metals, weight has been kept very low. The engines have cylinders and crankcases in one aluminum casting, with nitralloy steel liners. The crankshaft is in nitralloy steel with duralumin bearings. Duralumin is also used for the connecting rods, which are mounted direct on the shaft, without white metal. The cylinder head is in aluminum, with conically mounted bronze valve seats. The valves are vertical in the head and are operated by an overhead camshaft and spiral bevel gears. The drive is taken off the front end of the crankshaft, and the single unit electric generator and starting motor is also driven off the main shaft.

Taking advantage of the facilities for importing free of duty, the Ross steering gear is used and Bohnalite pistons are fitted, while American hydraulic brakes are employed and some of the rear axle and transmission parts are imported. The eight-cylinder chassis has a wheelbase of 118 in., a track of 56 in., and an overall length of 181 in.

Just Among Ourselves

Heavy Stocks of New Cars Meet Dealer Resistance

CAR dealers are resisting heavy stocks of new cars this year more strenuously than ever before. Conversations with factory sales executives indicate the existence of this tendency quite definitely. And while it naturally isn't causing any loud cheers from the factory organizations, there are those among factory men who grant that the purging process brought about thereby is likely to result finally in real stabilization for the industry.

Personally, we can't help but agree with this latter opinion. It is quite conceivable that the stiffer backbone on the part of individual dealers will help to bring about an equilibrium in factory-dealer relationships which will be better for factories as well as retailers in the long run.

* * *

Reduced Production Alone Will Not Cure All Ills

IT is quite possible, however, for dealer resistance to stocking new cars to go too far. Dealers don't make money merely by selling fewer cars. Profits for the retailer never will bloom from the barren soil of negative resistance.

After all, retailers as well as factories make money from selling as many vehicles as they can—at a profit. Merely refraining from selling as many cars as in the past won't bring profits to the dealer even if he keeps his inventory down to balance with what he sells. Reduced production alone won't put the average dealer on easy street.

Balanced inventories for the retailer merely provide a situation in which—by definite activity on his own part—he has a reasonable chance to operate at a fair profit.

This point will bear some emphasis at this time as there are indications that some people in the industry have come to regard reduced production *per se* as a formula for curing all automotive ills.

It won't.

* * *

Front-Wheel Drive Activity Spreading

FRONT-WHEEL drive activity is going on apace, although most of it seems to be just short of the announcement stage. If persistent merger rumors concerning four or five of the smaller automobile companies finally prove to be correct, there is some reason to believe that front-wheel drive constructions might be incorporated in some or all of the cars involved in the combination.

At least one big company is known to have been experimenting seriously with a front-wheel drive design for many months, while word has just reached us indicating that a French front-drive patent has recently been acquired by one of the oldest passenger car companies in this country.

* * *

May Eventually Sell in Ford Price Class

PRESENT indications are that any new front-drive cars likely to be announced during 1930 will be built to sell for something like $2000 or more, although it is possible that a lower priced vehicle of this type might enter the market within the next twelve months. Eventually, at any rate, it seems inevitable that the front drive will invade the price field around or under $1000. Some people with financial means have already had a vision of a front-drive job selling for less than current Ford prices.

So long as this construction is confined to relatively expensive jobs, of course, it will not constitute any considerable proportion of total sales. In its price class, the biggest selling front drive now on the market, the Cord, has fared well for its first year.

* * *

Automotive Readjustments Actually Began Last Year

THIRTY major lines of industry showed greater earnings in 1929 than in 1928, according to a chart published in the March 12 issue of Standard Statistics trade and securities service. Eight major lines, the chart shows, recorded less composite earnings last year than in 1928.

The automobile business—20 automobile and truck companies—was in the latter group along with radio, sugar producing and refining, rayon, silk and silk goods, meat packing, leather and shoes, and wool and woolen goods.

This comparison bears out the now generally understood fact that 1929 was no great boom year for the automobile business when viewed from the standpoint of individual companies. N.A.C.C. companies produced less and earned less in 1929 than in 1928.

The readjustment through which the industry is going now really was under way last year; its progress probably was accelerated by the stock market break, but in no sense was caused by that event. The resulting acceleration has meant tougher going immediately, but it probably also will mean quicker final stability and mounting profits on a sound basis.

And there is much to be optimistic about when one figures that in the year when we are making a major portion of this necessary merchandising readjustment, we will have at least the third and perhaps the second largest year our industry ever has known.

We're still in a great as well as a huge industry.—N. G. S.

Magnetic Induction and *Oscillograph* Developed for Steel *Tests*

Equipment makes possible inspection for cracks, seams, flaws, non-metallic inclusions and segregations. Grain size and structure characteristics may be studied also.

THE high stresses to which parts are subjected in aircraft and aircraft engines have made it necessary to apply more refined and more sensitive tests to the materials that enter into these products. In parts that are subjected to intense alternating or variable loads, many failures occur from fatigue, which is essentially the gradual enlargement of minute cracks or fissures that existed when the piece was put in service.

A method that has been used in the past to determine flaws in rolled bars, such as seams and laps, after the bar had been subjected to the heat-treating operation, consists in immersing it in a tank containing an acid solution. This acid dissolves the scale which was formed on the bar during the hot rolling and heat-treating processes and exposes the metal underneath, which is then carefully examined, preferably with a magnifying glass. All major defects are discovered by this method, as a rule, but minor defects often are overlooked, particularly since the minute examination of the entire surface of a complete bar is a very tedious procedure. Moreover, any defects that may be present below the surface of the bar are not revealed by this process.

A method for testing bar steel for defects by means of magnetic induction apparatus and an oscillograph has been developed by the Magnetic Analysis Corp. of Long Island City, N. Y. The apparatus is made in two forms, referred to as the standard production equipment and the special laboratory equipment. Each equipment comprises two induction coils placed coaxially a short distance apart and connected in series across alternating current mains by means of suitable switches. The primary winding of each coil is on the outside and the secondary winding on the inside. The bar of steel to be tested can be passed through these coils and in the standard production equipment hollow-faced sheaves or pulleys are provided on opposite ends of the coils on which the bars are supported and which make it easy to move them along through the coils.

An oscillograph is used for the detecting instrument. An oscillograph, it may be explained in this connection, is an instrument which produces a record of the variations of electric current flowing through it. When an alternating current flows through the primary windings of the coil, an alternating electromotive force is induced in the secondary windings, and both electromotive forces (primary and secondary) are recorded by the oscillograph. The primary or line electromotive force usually approaches a sine curve in form, and if the bar placed in the coils is of normal structure, the secondary electromotive force also will be of sine curve form. Any defects in the bar will

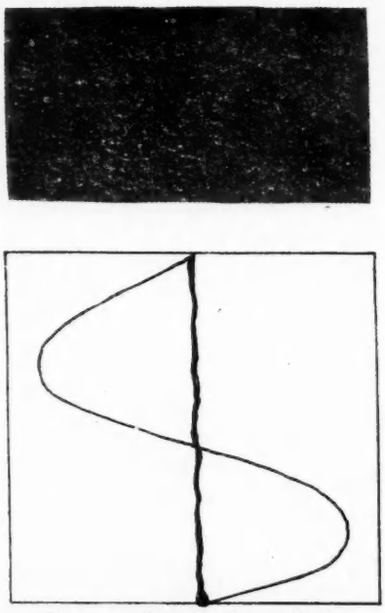


Fig. 1—Standard used for comparison—fine grained and free from defects

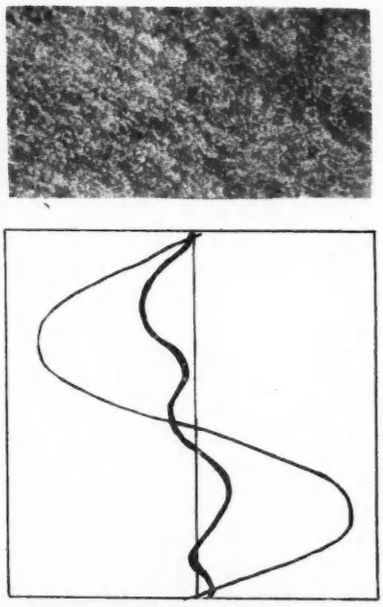


Fig. 2—The same material with a slightly coarser grain

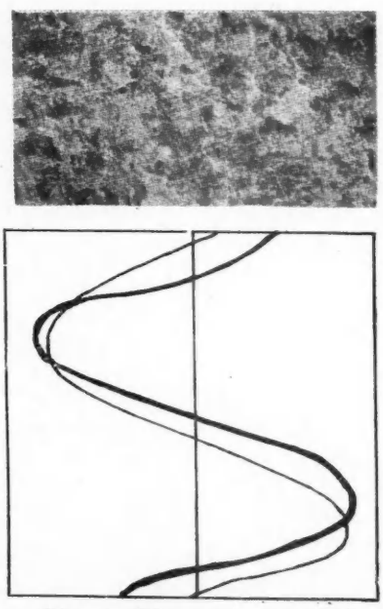


Fig. 3—The same material with a still coarser grain

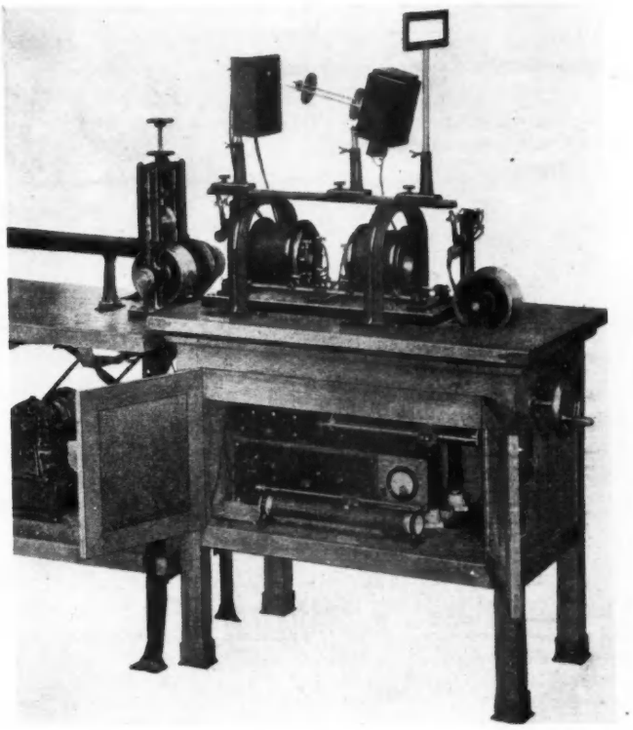
Apparatus

distort the curve of secondary electromotive force and the nature of the distortion is indicative of the nature of the defects.

In some cases oscillograms from standard materials are used for comparison, while in other cases the material is allowed to trace its own standard diagram. For producing the standard diagram a specimen of fine-grained steel, free from defects and free from decarbonization, is used. Each class or kind of steel has a fundamental or characteristic curve or oscillogram of its own. This characteristic curve also indicates the comparative grain size. All the other properties of the steel are indicated by harmonics of definite shape, superimposed on the fundamental curve. In an oscillogram all of the properties of the specimen are indicated, but by means of suitable "filtering" apparatus one property may be separated from another and indicated by itself by a light-signal relay or other suitable means.

Ordinarily the material is hand-fed through the coils, but semi-automatic feeding equipment can be supplied. The speed at which the material is fed depends upon its size and weight, but speeds up to 50 ft. per minute are said to be quite possible. The production equipment is made in four different sizes so far as the coils are concerned, taking rounds up to 1½ in. diameter, from 1½ to 3 in. diameter, from 3 to 5 in. diameter and from 5 to 7 in. diameter.

It is claimed that with this magnetic testing equipment such defects in steel bars as cracks, seams, flaws, non-metallic inclusions and segregations may be detected. Grain size and characteristics of structure due to change in grain size may be studied, as may the effects of heat treatment, hardness, and decarbonization. Other properties which affect the oscillogram are the hardness, carbon content, stresses and internal strains and heterogeneity of material with respect to chemical composition. See illustrations.



The standard production equipment for steel tests of the Magnetic Analysis Corp.

Where magnetic analysis of bar stock is practiced the pickling plant is not required. This is an important advantage in a plant manufacturing highly-finished metal products, as it is bulky and the acid fumes attack unprotected metal surfaces. The test is a non-destructive one, and since it is very rapid, it permits of 100 per cent inspection.

Some specimen oscillograms taken with the standard production equipment are reproduced herewith. Fig. 1 shows an oscillogram obtained from a standard specimen composed of fine-grained steel, free from

(Continued on page 559)

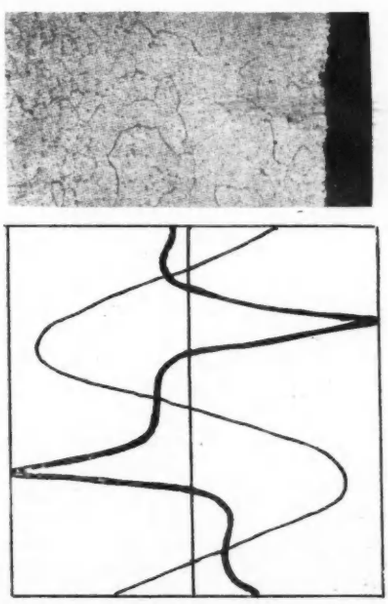


Fig. 4—The same material having surface decarbonization

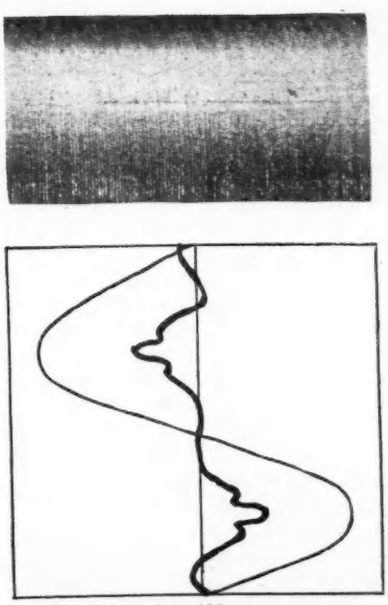


Fig. 5—Oscillogram and specimen indicating a fine seam

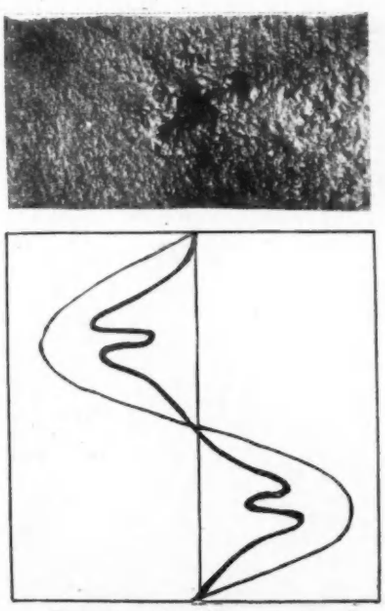


Fig. 6—Oscillogram and specimen showing a pipe in the center

THE FORUM

Unlined Aluminum Cylinders for Sleeve-Valve Engines

Editor, AUTOMOTIVE INDUSTRIES:

In your issue of March 8, 1930, a letter was published stating that a sleeve valve engine using aluminum cylinders was made by Minerva Motors in Antwerp in March, 1924, and it may interest your readers to know that such an engine was made in this country in 1918. This engine was designed by the writer and had four cylinders 5⅛ in. bore by 7 in. stroke with the cylinder block of aluminum alloy and with inverted cylinder heads made of the same material. The sleeves were of cast iron and were operated by a valve crankshaft having one throw per cylinder connected to each sleeve by a small connecting rod so that the sleeves were given a reciprocating motion the same as in the Knight engine. This engine was subjected to considerable testing in July, 1918, and, while having low compression, developed 91 b.hp. at 1400 r.p.m. on ordinary gasoline using 0.53 lb. per b.hp. hour.

No trouble was experienced with wear on the cylinder, cylinder heads, or sleeves, the sleeves taking a good polish while the cylinders did not show the least wear. The results were very promising and seemed to indicate that an engine in which the sleeves operated against an aluminum alloy cylinder wall would be satisfactory and save considerable weight over the iron cylinders. The fact that only one sleeve was used may have had something to do with the lack of oiling difficulties, wear and burning of the valve ports, as it seems reasonable to suppose that the elimination of the intermediate working surface between the usual double sleeves would reduce cooling and oiling troubles.

This work was not carried further at the time because of certain changes in the organization under whose management it was being conducted and because it was necessary for the writer to take up other lines of work, but from the results obtained from the particular engine in question there did not seem to be any trouble that would discourage further experimenting along the same line and the writer hopes some time to be able to take up the matter again as he believes that sleeve valve engines with aluminum alloy cylinders can be made to operate successfully and would have some very great advantages.

A. E. OSBORN.

Editor, AUTOMOTIVE INDUSTRIES:

If memory serves me correctly, Eugene Gruenewald, general superintendent of the old Root & Vandervort Engineering Works at East Moline, Ill., experimented, and with more or less successful results, with an unlined aluminum cylinder block in 1915 or 1916.

My impression is that the *Automotive Industries*—then *The Automobile*—carried a photograph of this cylinder block contemporary to Mr. Gruenewald's work.

We made the aluminum casting for this in the Aluminum Castings Co. plant at either Detroit or Cleveland. This is anent Mr. Deschamps' contribution to the "The Forum" in his letter published in the March 8 issue.

J. E. DIAMOND.

(We were unable to locate a reference to this block in *Automotive Industries* and therefore wrote to Mr. Gruenewald, who is now vice-president of the Ross Gear & Tool Co. of Lafayette, Ind. He replies as follows:

"To my knowledge no photograph of this block was taken, nor do I know of any information about this experiment which may have been published. The facts are that we were not very successful with these tests, principally on account of defects in the casting. We were not able to go very far with our tests on account of porosity in the metal, in spite of repeated efforts on the part of the aluminum company to stop existing water leaks. Our tests were not completed on that account."

Since this carries the historical references back to a time when the state of the art of aluminum casting evidently did not permit of the use of unlined engine cylinders of the light metal it seems appropriate to close this discussion.—*Editor.*)

Truck Development

Editor, AUTOMOTIVE INDUSTRIES:

I do not know just how many trucks are owned and operated by my company. I have nothing to do with their specification, selection or operation, but when troubles occur I am asked for an opinion frequently enough. I have no great fund of truck engineering to draw upon, but by analogy with passenger car work it seems to me that the heavy vehicle field is quite full of unsolved problems. No doubt a large proportion of truck troubles are due to the owner's abuse of his equipment, but even when maintenance is above criticism things do seem to happen to trucks that are rather a surprise. Truck manufacturers of the very highest repute with years of experience behind them seem still able to produce new models that prove to be "lemons" and in this comment—for it is not a criticism—I include several of the very foremost companies.

Our experience covers all the principal trucks and a good many models of each, and it is not overstating the case to say that no make has shown consistent quality of engineering through all its models. I suppose that the mistakes made in passenger chassis design do not show up so conspicuously as do similar errors in trucks, but for all of that, things on trucks still break or otherwise fail in just the same places and ways they did 20 years ago, and there is an obvious tendency to

try to offset such failures by making the old design heavier, rather than to use a more scientific construction. It is a sound engineering maxim that things which *are* right *look* right and there are plenty of truck parts that look clumsily massive.

For one thing the mating of the truck chassis and the body or tank which it carries is a very inexact science—let's hope it is a science, for it certainly is not "art," except in rare cases. In the particular case of tank trucks the tank is a beam of great strength and stiffness, yet it is hardly ever mounted so that its strength is of any assistance to the chassis frame. I have frequently seen mountings so ill designed that the chassis and tank worked against each other to the very real detriment of both. Of course, such cases meant lack of cooperation between the truck engineer, the tank maker; and the user, too, perhaps, but one would expect the setting of tanks on chassis would by this time have become standardized, at least as to principle.

Just now there is a keen desire on the part of oil distributors to carry larger loads, with or without trailers, and this has laid bare a situation rather like the development of ships of war. First an armor plate no gun can pierce, and then a gun that can pierce any plate, and so on. That is to say, first we have a rear end that will stand anything, and then an engine that will pull any rear end to bits. First an engine that will haul any load, and then a load that will wear out any engine in quick time. In a word, while the passenger car manufacturer has always kept ahead of the demands of his public, the truck maker seems to lag behind the requirements of industry.

Let me again emphasize that I am an outsider looking from afar, dispassionately. Maybe the user is all to blame, maybe he is asking the impossible, maybe the variability of the demands made upon the truck maker is such that no all-around satisfaction is to be expected. Also, despite all my complaining, trucks do haul heavy loads at a remarkably low cost. The modern motor truck is a very great advance upon its ancestors. It is simply that by comparison with the passenger car it seems we could have expected still more advance.

For one thing the problem of distributing traction between more than two wheels is vital to the development of heavier-load carrying trucks, and for all the years various forms of four-wheel drive have been known we still seem a long way from a solution that will be generally pleasing to engineers. For another, the durability of larger engines as compared with the old truck types is generally not too satisfactory, basing life on miles run and not on years of service. Where good engines of higher power have existed they have often proved too much for transmissions, for universals or for final drives.

Treading on still more dangerous ground, it seems to me that the coming of the motor bus laid bare a lot of weakness in the fundamentals of our truck design. The present bus is far from a perfect machine, but the fact that it carries a live load with opinions and the gift of speech, has fomented bus development to a pace that the truck never saw. Bus engineers are working out things truckmen *could* have done long ago. Not that the problems of the two are identical. Passenger car, truck and bus fill different needs, but the bus learned and took more from the passenger car than from the truck and developed a lot of its own. There is nothing *clumsy* about a good bus and there is still lots that is clumsy about the best of trucks.

A. LUDLOW CLAYDEN.

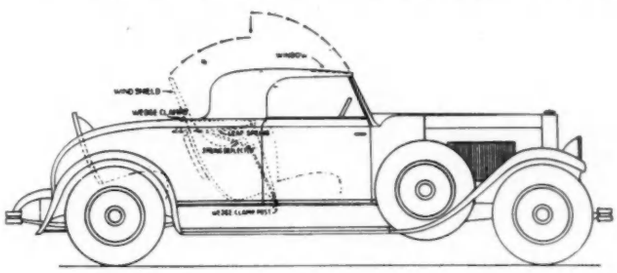
Convertible Bodies

Editor, AUTOMOTIVE INDUSTRIES:

From the discussion of convertible bodies reported in the February issue of the *S.A.E. Journal* it appears that the greatest difficulty in present construction is the avoidance of rattles, and to secure covering material which is not perishable.

It appears that any fabric if folded often is subject to early ruin. Faded cloth tops which have shrunk to tight fit on the bows are very unsightly.

Convertible coupes may be built with tops which lower as a single unit without folding. Such a convertible top is shown in the accompanying drawing. It may be made of sheet metal or fabric on a rigid frame. A glass window in the forward portion of the roof becomes a rear windshield when the top is lowered partly into the body. The operation of lowering consists of rotating backward and pushing it partly into the body, leaving the front of the roof projecting above the body. The lower edges of the top are flared outwardly and normally press up against a rubber strip at the body edge to make a water and rattle-proof junction between top and body. Cushioning springs under the lateral pivots (about which the top is rotated) serve to carry the weight of the top and make manipulation easy. Clamps, side-door windows, etc., do not vary from the usual convertible construction.



Drawing of convertible coupe body, with a single unit top, which lowers into the body without folding, as described in the letter by B. B. Ellerbeck

This type of convertible top is as durable as the body, is easily washed and kept sightly, affords plenty of visibility when lowered, and gives wind protection to rear passengers.

B. B. ELLERBECK.

Grinding Crank Pins

FORTY pins for an eight-cylinder crankshaft or five complete crankshafts per hr. are being ground in one well-known plant by the equipment shown in the accompanying illustration. A Landis Standard 16 in. hydraulic crank grinder is fitted with a stationary hydraulic work rest by means of which all the pins on a shaft may be ground in one machine with a single work setting. Hydraulic power is used for the work rest, for clamping the work, for feeding the wheel and for driving the work carriage. A 36 in. grinding wheel is used.

Landis crank grinder

Hydraulic Shock Absorber Offered by Stewart-Warner

In the Hydro-Cushion, a compensator automatically adjusts the normal center of the springs in accordance with the car's static load.

IN developing their new hydraulic shock absorber, known as the Hydro-Cushion, engineers of the Stewart-Warner Corporation proceeded from the premise that in order to insure satisfactory control of the springs under all conditions, a variable by-pass must be provided which will insure operation always from the normal center of the springs. This, of course, involves the use of a compensator which adjusts the center in accordance with the static load on the springs.

In the Hydro-Cushion, a compensator automatically keeps the tapered control pin in the neutral or center zone (shown in Fig. 1) regardless of varying static load. The compensating movement is comparatively slow and is said to be unaffected by the quick flexing action of the springs in actual travel.

Fig. 1 shows the design of the variable by-pass controlled by a pin and orifice. Fig. 2 is a cutaway view that shows the detail construction and relative positions of the component parts.

In the neutral zone, which is the normal center, the springs are permitted to flex and ripple as in boulevard driving. Movement of the frame toward the axle calls into play the main control, which acts in the left-hand cylinder. Here the tapered control pin operates in such a way as to not materially retard the beginning of rebound, for at this time it is necessary for the springs to start the upward movement of the car body. But as spring action speed increases, so does resistance to this action. The recoil, however, is said to be effectively cushioned against violent upthrow.

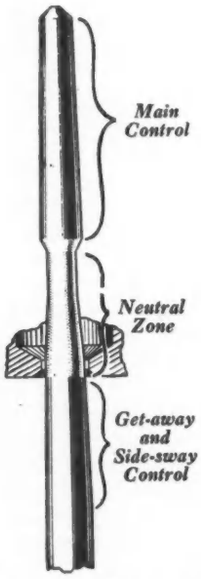


Fig. 1—By-pass control pin

In this way the springs are permitted to return to their normal position quickly although still under sufficient control. Quick return action is, of course, necessary so that springs may be ready for the next bump. The action likewise is said to eliminate axle pounding.

A tapered by-pass is also utilized in the right hand cylinder to control spring compression. As in the rebound control, it allows sufficient freedom for quick flexing of springs, the resistance gradually increasing as the chassis approaches the axle, thus preventing bottoming.

The device also serves a third function, that of side-sway control. Getaway and side-sway control starts in the neutral zone and extends in the direction of the movement of the car body away from the axle. While substantially free at the neutral zone, the control gently closes off the by-pass when any side-tilt of the car body occurs, as in making a turn at high speed, to keep the car on an even keel.

The Stewart-Warner Hydro-Cushion is manufactured in two sizes, one heavy and one of medium weight. Each of these two sizes come in a single as well as a double-cylinder type. It is claimed that the device can be adapted to the spring-control requirements of any car, as the main, neutral, and side-sway controls may all be varied to any desired degree.

Fig. 2—Cutaway view of Stewart-Warner Hydro-Cushion

ACCORDING to the Bendix Service Corp., brake service stations in order to be able to take advantage of the business offered by truck owners, must be in position to do work on truck brakes during the hours when these vehicles are not being operated as a rule, that is, at night. A service station intended for complete wheel and brake repair work should have a full mechanical equipment and plenty of light, the latter being an important factor because of the precision work involved.

Lag in Oil Engine Injection Systems Depends Upon *Design and Pressure*

Tube lengths for all valves must be the same, according to results obtained by A. M. Rothrock in experiments made at the Langley Memorial Aeronautical Laboratory.

AN investigation dealing with injection lags in common-rail fuel injection systems for oil engines has been conducted at the Langley Memorial Aeronautical Laboratory, Langley Field, Va., and is covered in Technical Note No. 332 of the National Advisory Committee for Aeronautics, the author of the note being A. M. Rothrock.

Common-rail injection systems for oil engines divide into two classes. In one of these an automatic injection valve is used, operated by the pressure of the oil in the line, oil being admitted to the injector valve from a high-pressure reservoir by means of a mechanically-operated timing valve. With this system there is an injection tube between the timing valve and the injection valve which in many cases is of considerable length.

There is, therefore, a definite time interval (injection lag) between the opening of the timing valve and the start of the oil spray from the fuel injection valve. This lag depends upon the design of the injection system and the oil pressure employed for its operation. Provided the timing valve operates with sufficient rapidity to permit uninterrupted oil flow through it, the injection lag is independent of the engine speed, hence the results of the investigation are given in seconds instead of in crank angles.

The N.A.C.A. spray photography equipment was employed for this investigation. With this apparatus it is possible to take motion pictures at the rate of 2000 to 4000 per second of the formation and development of single fuel sprays. The injection system investigated is shown in Fig. 1. The timing valve cam is operated by a clutch which, when engaged, causes the cam to make a single revolution at a speed of 950 r.p.m. As the timing valve needle is lifted the oil under pressure in the high-pressure reservoir is released through the injection valve tube to the injection valve. The oil pressure acting on the annular area of the injection valve stem forces the stem against the stop and the oil is sprayed into the chamber. Approximately 0.003 seconds after the timing valve needle has lifted the by-pass valve is opened. Since the ratio of the area of the by-pass valve to the area of the orifice in the injection valve is large, the oil flows through the by-pass valve; the pressure drops below that required to hold the injection valve open, and the stem returns to the seat.

The investigation had a range covering tube lengths from 10 to 70 in., tube bores from 1/16 to 5/32 in., valve opening pressures from 2000 to 5000 lb. per sq. in., injection pressures from 4000 to 10,000 lb. per sq. in. and initial pressures from 1000 to 3800 lb. per sq. in.

It was found that the injection lag increased linearly with increase in injection tube length, but was not affected by the bore of the tube. The lag increased slight-

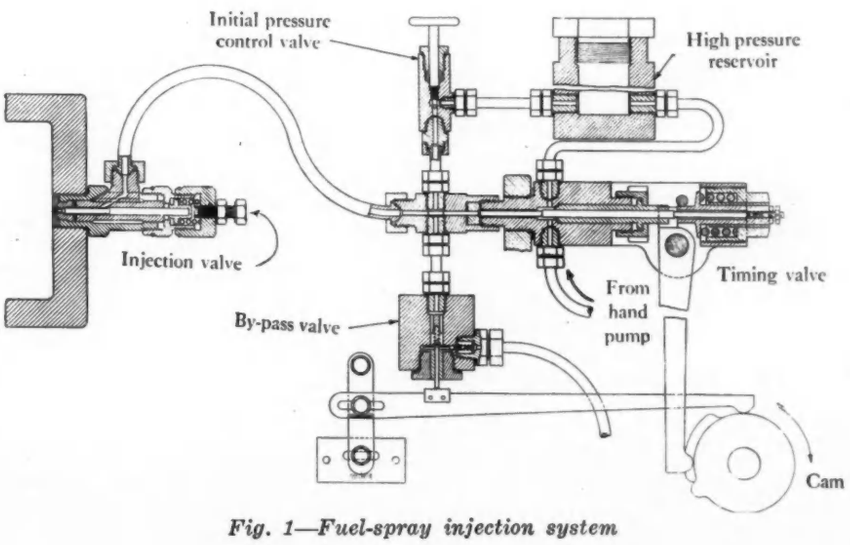


Fig. 1—Fuel-spray injection system

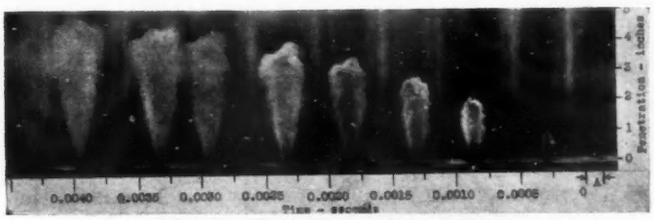


Fig. 2—Fuel-spray photographs
Injection pressure, 8000 lb. p. sq. in. A, Time interval from first photograph to start of fuel spray

Fig. 3—Record of motion of timing valve stem
B, Time interval, from start of timing valve motion to first photograph

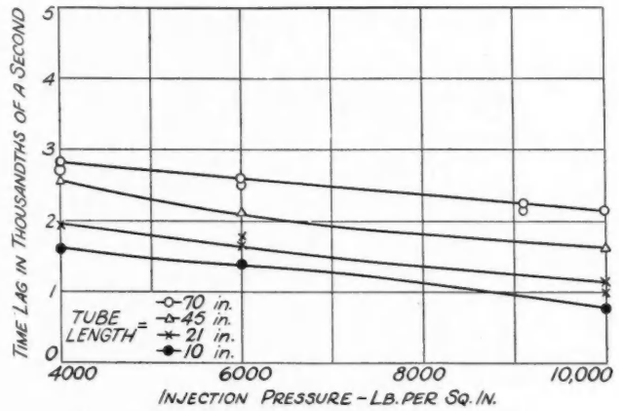


Fig. 4—Effect of length of tube on time lag

Circles correspond to the following experimental conditions: Initial pressure, 1000 lb. p. sq. in.; injection pressure, 4000 lb. p. sq. in.; valve-opening pressure, 4000 lb. p. sq. in. Crosses correspond to the following conditions: Initial pressure, 1000 lb. p. sq. in.; injection pressure, 8000 lb. p. sq. in.; valve-opening pressure, 4000 lb. p. sq. in.

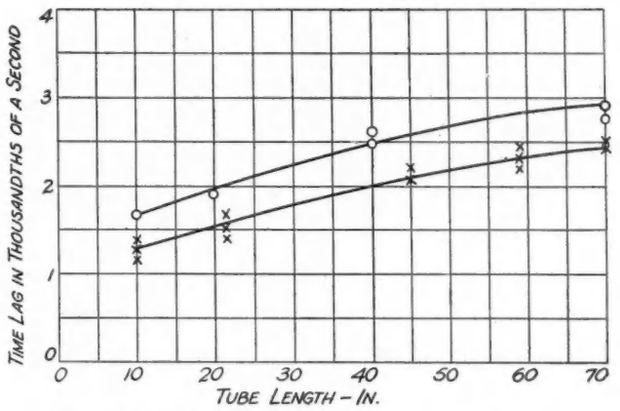


Fig. 5—Effect of injection pressure on time lag

Valve-opening pressure, 4000 lb. p. sq. in.; initial pressure, 1000 lb. p. sq. in.

ly with an increase in valve opening pressure and decreased materially with an increase in injection pressure. The initial pressure in the injection valve tube before the opening of the timing valve did not affect the injection lag, providing the injection pressure was considerably in excess of the valve opening pressure.

From the results of the experiments the conclusion is drawn that in the design of common-rail injection systems care must be taken to obtain the same injection-valve tube lengths for all valves, as otherwise the time at which injection starts will not be the same for all valves.

Gasoline More Volatile Than Last Year

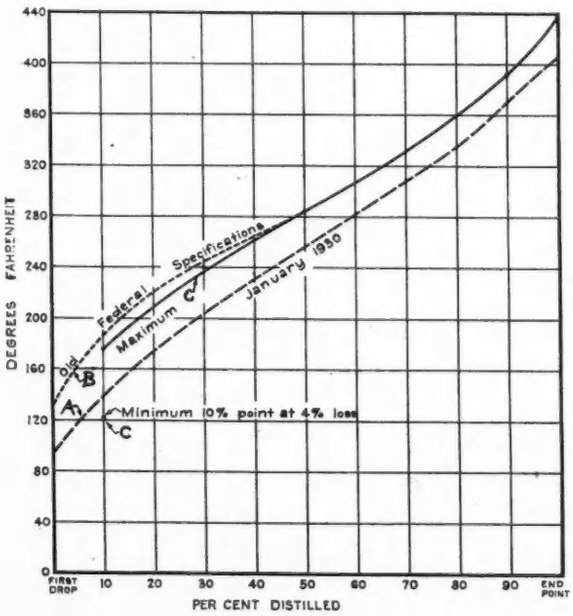
A REPORT of the Bureau of Mines on its twenty-first semi-annual motor-gasoline survey, shows that the motor gasoline which was being marketed in the United States the past winter was decidedly more volatile than that sold a year ago. Samples from all cities showed a decided improvement in volatility, with the sole exception of those from Laramie, Wyo., which showed a small decrease.

As in the past, distillations evidenced a distinct difference between winter and summer gasoline, in that gasoline marketed in the winter is more volatile than that marketed in summer. The difference is large over practically the whole distillation range.

The report of the survey, by E. C. Lane, E. L. Garton and O. C. Blade, forms Bureau of Mines Report of Investigations No. 2995.

On June 11, 1929, the Federal Specifications Board revised the distillation requirements for United States motor gasoline. This revised specification became mandatory on Septemer 11, 1929, for gasoline purchases by all Government departments. The revised requirements are as follows:

Distillation Range—Method 100.13. When 10 per cent has been recovered in the receiver, the thermometer shall not read more than 80 deg. C. (176 deg. Fahr.) nor less than 50 deg. C. (122 deg. Fahr.); provided that, for each per cent distillation loss less than 4 per cent, obtained in the A.S.T.M. distillation, the minimum 10 per cent temperature requirements shall be lowered 3 deg. C. (5.4 deg. Fahr.). The government reserves the right by proper provision in the contract or purchase order to lower the maximum 10 per cent either 9 deg. Fahr. or 18 deg. Fahr. Administrative action in this respect may be taken by contracting officers to meet the temperature conditions under which the equipment must operate. (See Note 1).



Distillation curve of average gasoline; A, average for January, 1930; B, old federal specifications; C, Federal specifications, effective September 11, 1929.

Note 1—Contracting officers are advised that in general the expectation of freezing temperatures warrants the lowest maximum 10 per cent temperature.

Note 2—When U. S. Government motor gasoline is to be used for some special purpose, such as that requiring tropical storage, the Government reserves the right to raise the lower limit at the 10 per cent point to not higher than 60 deg. C. (140 deg. Fahr.) with the same corrections for distillation loss as given above.

In order to compare the new specifications with the old, as well as with the average distillation curve for the gasolines reported in this survey, the old specification is shown as a dotted curve in the accompanying group.

Man-Hour Productivity Increased 178 per cent in 13 Years

Gain in automotive lines surpassed only by the rubber tire industry, which showed 292 per cent advance since 1914.

By L. W. MOFFETT

THE man-hour productivity of the automotive industry showed a decrease of less than 1 per cent in 1927 when compared with 1925, according to the Bureau of Labor Statistics, Department of Commerce. But when compared with 1914, the man-hour productivity in 1927 showed an increase of 178 per cent, being exceeded only by the rubber tire industry, which showed an increase of 292 per cent in that period, while it made an increase of 11 per cent in 1927, when compared with 1925. The study covers 11 manufacturing industries.

The automobile industry not only covers the manufacture of all classes of complete motor vehicles, but also the manufacture of automobile bodies and parts. Engines, batteries, lighting and starting systems, springs, etc., are not included in this study.

The index numbers of production are based on the total number of motor vehicles produced each year divided as follows: open cars, closed models and trucks. Index numbers were prepared for each group and the three index numbers were combined, after weighting, to form a composite index number for the industry as a whole.

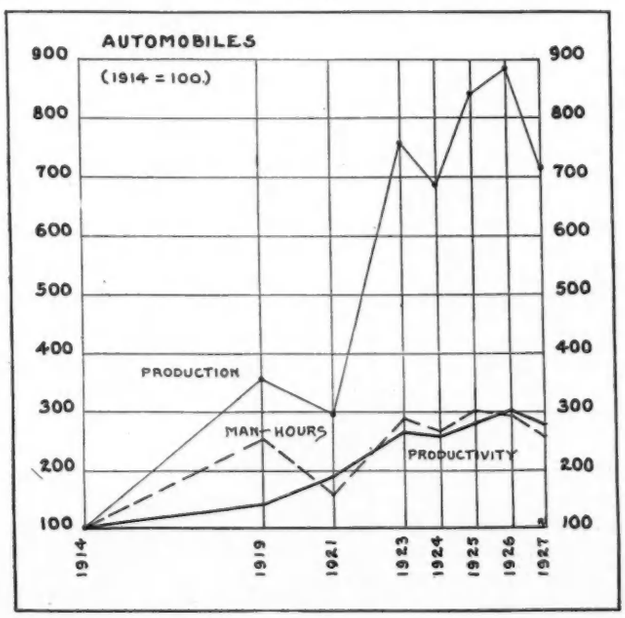
Taking 1914 for the index 100, the man-hour productivity in the automobile industry has shown remarkable strides, as denoted by the following index numbers: 1904, 40; 1909, 35; 1919, 141; 1921, 190; 1923, 265; 1924, 258; 1925, 280; 1926, 302; 1927, 278.

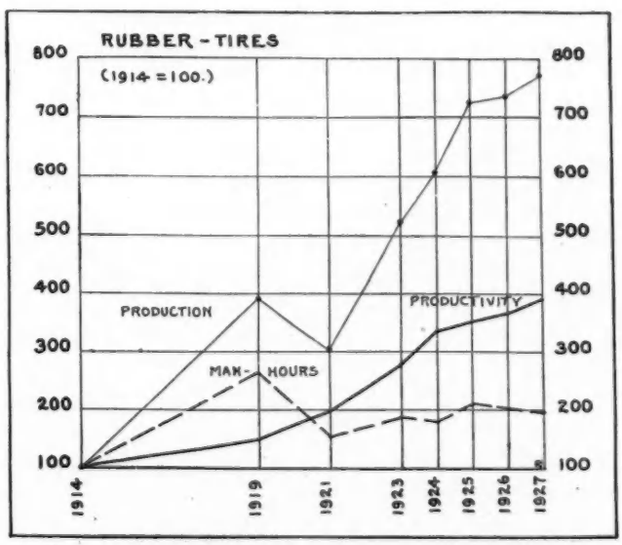
Index numbers were prepared for the total output of each of the three main divisions of products: Pneumatic tires, including motorcycle and bicycle tires as well as tires for motor vehicles; inner tubes, likewise for the three types of vehicles, and solid tires for trucks, etc. After weighing the respective index numbers for each year, they were combined to form a composite index number for the rubber tire industry.

Automobile Plants

Year	Man-hours	Production	Man-hour Productivity
1904	10	4	40
1909	62	22	35
1914	100	100	100
1919	252	355	141
1921	157	298	190
1923	286	758	265
1924	266	687	258
1925	301	842	280
1926	293	884	302
1927	258	781	278

Index number of man-hours, production, and man-hour productivity in the automobile industry, for specified years, 1904 to 1927



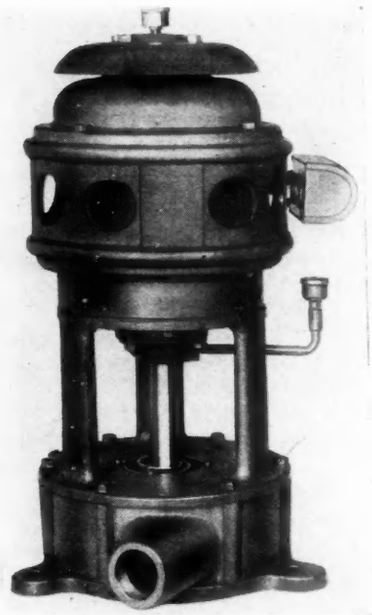


Man-hour productivity in the automobile industry is charted at the left
Above is a similar graph of the trend in rubber tire manufacture

NEW DEVELOPMENTS—Automotive

Vertical Lubricating Pump

SUITABLE for supplying coolant to a number of machines from a central reservoir, for energizing hydraulic movements, and for cleaning and humidifying systems, the Model A L, two-stage pump has been added to the line of the Ruthman Machinery Co., Cincinnati, Ohio. It is of the vertical motor-driven type, developing 39 lb. per sq. in. pressure and delivering a head of about 90 ft.

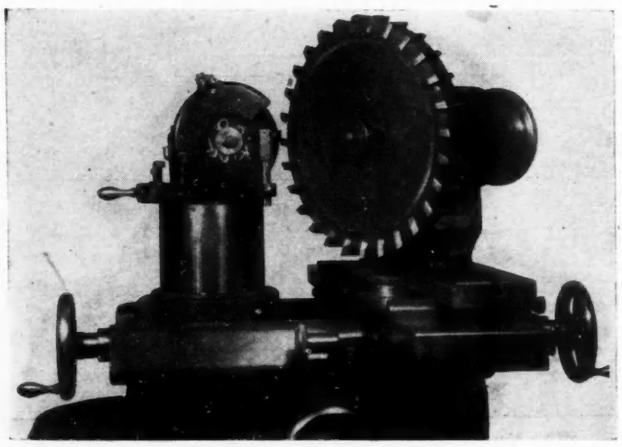


Ruthman vertical fuel pump

Like the other gusher pumps, it is mounted on ball bearings and has no packing. The intake is constructed with a stationary device of three curved blades to prevent the water from whirling and forming a conical shape. This feature is said to prevent the entrance of air, thus making the flow solid and free from air bubbles. This unit is equipped with a built-in motor of 1½ hp. capacity at 1750 r.p.m.

Face Mill Grinding Unit

FOR sharpening face mills 8 in. in diameter, and up to and including 18 in., a face mill grinding attachment has been developed by the Cincinnati Milling Machine Co., Cincinnati, Ohio, for use with the No. 2 Plain or Universal Cincinnati cutter grinders recently announced. The attachment consists of three units: the spindle assembly, swivel base and a special arbor. The work spindle has a No. 7 Morse taper hole and is mounted on anti-friction bearings front and rear. A knurled hand wheel on one end of the spindle facilitates swinging the mill to the grinding position. The swivel base is graduated in degrees enabling the operator to swing the work to any position. Provision has been made for locking the spindle after the cutter blade is set in line with the centerline of the grinding wheel spindle so as to prevent any movement of the cutters while setting up the tooth rest.

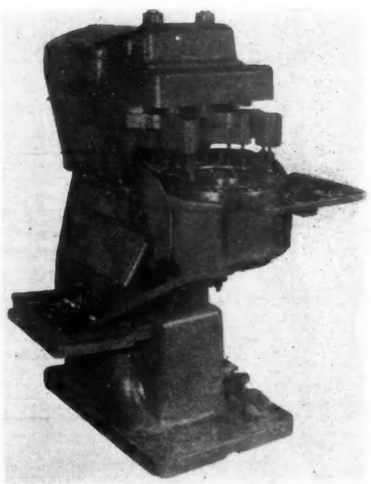


Cincinnati face mill grinding attachment

The distance between the centerline of the attachment and table is 9½ in. Equipment consists of a No. 7 Morse taper arbor for holding face mills that fit spindles having the National Standard Spindle end; a special pulley, and an 8-in. diameter straight grinding wheel and wheel guard. Net weight is 135 lb.

Automatic Tapping Machine

AUTOMATIC multi-spindle tapping with a maximum capacity of four ⅜-in. taps in ¼-in. steel stock and a maximum production rate of 20 to 120 pieces per hour is made available on the Globe automatic tapping machine recently announced by the Globe Tapping Machine Co., Bridgeport, Conn. This machine can be supplied with conveyor feed, push feed, dial feed or drum feed. The motor is mounted on a tilting plate inside the base of the machine, and from the motor the drive is by belt to the clutch pulley at the rear of the tapping head, then through intermediate gears to the spindles. The spindles may be adjusted as to location by moving the intermediate spur gears and the spindles. They are so arranged that the tap follows its own lead, permitting the use of taps of different sizes on the same machine.



Globe automatic tapping machine

Indexing of the work carrier as well as lifting the tapping head is accomplished by cam action. All high-speed shafts are mounted on ball bearings. Coolant is pumped to the taps from reservoir in the base. The clutch drive is connected to a foot treadle for convenient starting and stopping the machine. In addition all the new machines have an automatic tripping mechanism which connects with the clutch and stops the machine automatically in case of interference with the indexing of the work carrier. The machine automatically ejects the completed parts.

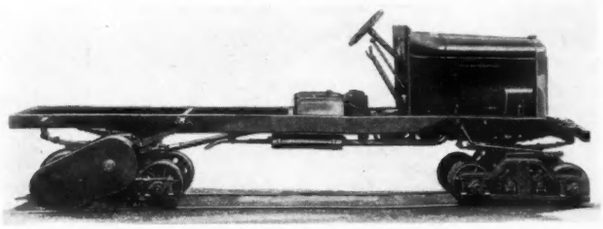
The electric motor is 1 to 2 hp. capacity 1750 r.p.m.—A.C. or D.C. as desired. Floor space is 40 x 40 in. for

Parts, Accessories and Production Tools

the conveyor and push type feed; 35 x 40 in. for the drum type, and 33 x 50 in. for the dial type.

Koppel Rail Car

KOPPEL INDUSTRIAL CAR & EQUIPMENT CO., Koppel, Pa., has developed equipment for converting Dodge Brothers truck chassis into railway motor cars. The front axle is replaced by a four-wheel truck with flanged wheels, while at the rear either flanged

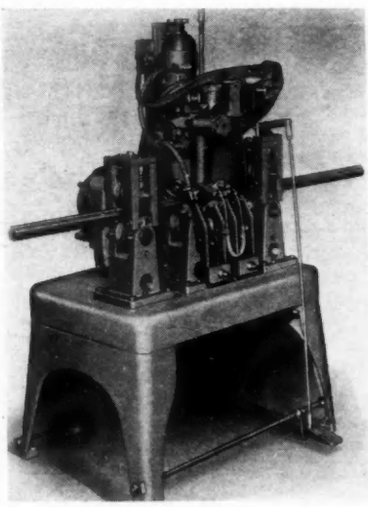


Dodge truck chassis with Koppel rail equipment

wheels are secured to the ends of the axle shafts or else a four-wheeled truck is substituted for the regular wheels, the rear pair of wheels of this truck being flanged and mounted on a solid axle which is driven from the chassis rear axle by roller chain. These converted chassis are fitted with passenger bodies of the regular railway type which extend forward to completely cover the engine hood. These cars will carry as many as 32 passengers and are made to run on tracks of either standard gage or narrow gage.

Brake Shaft Welder

AN automatic machine designed for the manufacture of brake cross-shafts, by use of the arc welding process, featuring the Electronic Tornado, is announced by the Lincoln Electric Co., Cleveland, Ohio. The function of this machine is to weld a longitudinal seam across the shafts as they come from the press. The shafts are fabricated of ⅛-in. plate and are formed into a tube 1¼ in. in diameter and 36 in. long. As they come from the press, the two edges bent perpendicular to the circumference and adjacent to each other, are fused together at the rate of 36 in. per minute.

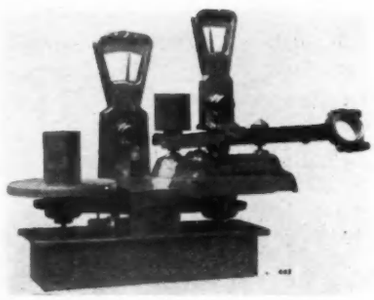


Lincoln automatic welder for brake cross-shaft

The shafts are fed through the machine under the stationary electrode and progress automatically as the seams are welded. The electrode forming one end of the arc is fed down at the speed required to maintain a steady uniform arc, and the shaft then is fed at the proper welding speeds. No filler rod such as is generally used in automatic welding is necessary on this machine. This machine requires a floor space of 6 ft. by 4 ft. It is operated by a D.C. shunt motor of 1½ hp. capacity.

Connecting Rod Scale

A CONNECTING rod scale which measures both total weight and center of gravity, against dead, sealed master weights and shown in the accompanying illustration, has been developed by the Exact Weight Scale Co. of Columbus, Ohio.



Exact Weight Scale Co. device for weighing connecting rods

The principal features of this scale are that they are not affected by inaccuracies of level, by vibration or by climatic conditions. They are of the even balance type and thus require little servicing or calibration. The combined effect of weight and center of gravity is obtained through the use of two scales, with the center of gravity scale mounted on one pan of the total weight scale.

VARIABLE TEST MACHINES

(*Continued from page 551*)

defects and decarburization. The corresponding micro-photograph is also shown. Fig. 2 was obtained from the same material with a slightly coarser grain. Fig. 3 also was obtained from the same material, with a still coarser grain. These three oscillograms illustrate the method of use of the equipment by which the oscillograms obtained are compared with oscillograms from a standard specimen.

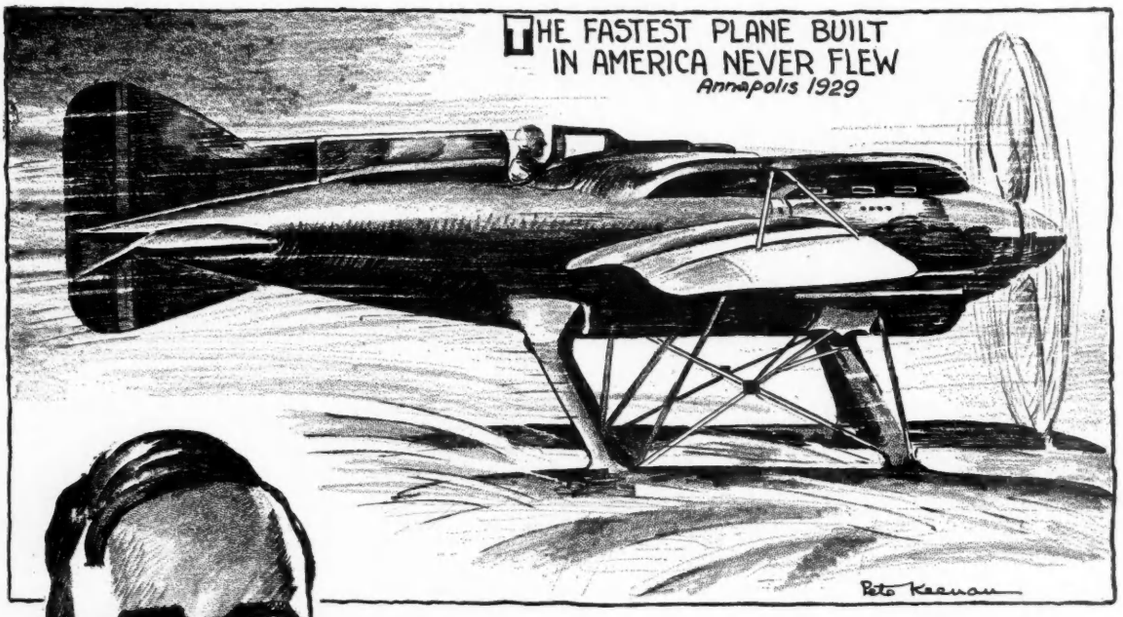
Fig. 4 is a further example of the same method, the oscillogram having been obtained from a specimen of the same material which, however, showed surface decarbonization. Decarbonization is indicated in the oscillograms by sharp peaks.

Fig. 5 is an oscillogram taken from a bar in which there was a fine seam. The presence of this seam was verified later by turning the bar down to about one-half its original diameter. The seam is clearly shown by the photograph. Fig. 6 is from a bar having a pipe in the center, as was later verified by breaking the bar in two.

It may be judged from the foregoing that a certain amount of skill is required to properly analyze the oscillograms, more particularly since all of the characteristics of the sample are recorded in them. The use of separating filters, as previously mentioned, simplifies the task to a certain extent. An objection that has been raised against such magnetic tests in the past is that they are too sensitive.

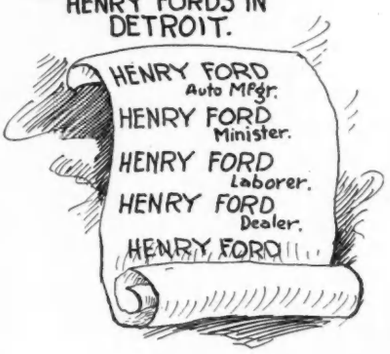
Automotive Oddities by Pete Keenan

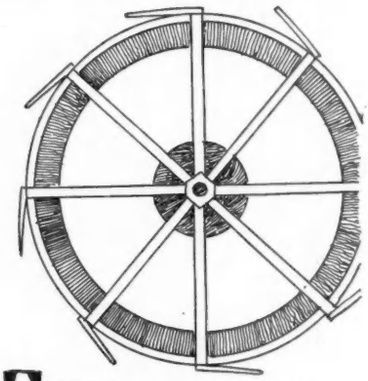
THE FASTEST PLANE BUILT IN AMERICA NEVER FLEW
Annapolis 1929



J.W. FRAZER, WHO HAS FOUND A WAY TO CONVERT THE DEADLY CARBON MONOXIDE GAS PRESENT IN CAR EXHAUSTS

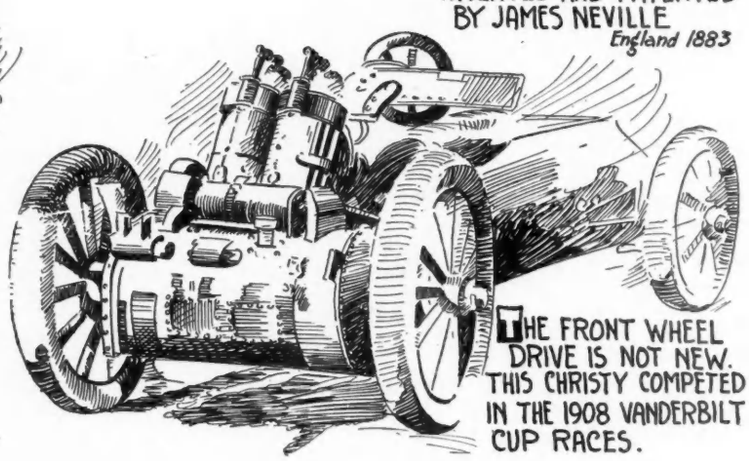
THERE ARE 13 HENRY FORDS IN DETROIT.





A SPIKED WHEEL WAS INVENTED AND PATENTED BY JAMES NEVILLE
England 1883

IN SPAIN A BLUE CAR IS TABOO BECAUSE IT IS THE COLOR CHOSEN BY THE ROYAL FAMILY.



THE FRONT WHEEL DRIVE IS NOT NEW. THIS CHRISTY COMPETED IN THE 1908 VANDERBILT CUP RACES.

First with the News

Reliable, Accurate

News of the Industry

PAGE 561 VOLUME 62 *Philadelphia, Saturday, April 5, 1930* NUMBER 14

Gorrell Describes Stutz Operations

Denies Recent Rumors of Closing and Bad Financial Position

INDIANAPOLIS, April 3—Before leaving last Saturday on a business trip by airplane for California, E. S. Gorrell, president of the Stutz Motor Car Co., issued a statement emphatically denying reports relative to the Stutz company, which he said had been widely circulated recently.

In his statement Mr. Gorrell denied that the company is contemplating removal to St. Louis; that the plant is closed down; that its output is being sold at cut prices, and that it is heavily in debt. He said, "Our production lines were closed for a short time in the dead of winter, the same as the production lines of practically every other automobile manufacturer in the country. However, they were opened immediately after the Chicago automobile show and we are at the present time manufacturing Stutz and Blackhawk automobiles on a schedule which has increased from week to week and we have not only put on a considerable number of workmen but are adding to our force as the production schedule is increased.

"In spite of adverse general business conditions, and in spite of the inestimable damage done to the good will of the Stutz organization by the unfortunate litigation placed against us about the first of the year, this company is making remarkable progress.

"The Stutz Motor Car Co. of America, Inc., stands today with quick assets of $189,310.91 greater than it had a year ago today. Its accounts payable are $143,014.81 less than they were a year ago today. A year ago the Stutz company owed the banks $1,331,805.67. Today the Stutz company has no bank loans of any kind and in the course of the year 1929 the Stutz company paid off the banks approximately $1,800,000. The contingent liabilities of this company are today $3,021,805.67 less than they were a year ago today."

Wright Gets Soviet Order

NEW YORK, April 1—Wright Aeronautical Corp. has sold 40 of its 600 hp. Typhoon water-cooled marine engines to the Soviet government. This order amounts to over $700,000.

Editor Sails

George E. Quisenberry

George E. Quisenberry, editor of the *American Automobile* Overseas Edition and *Automovil Americano*, New York, sailed Thursday for a tour of South American automobile distributing centers, planning to return early in July. He will visit Peru, Chile, Argentina, Montevideo, Uruguay and Brazil.

March Output Gains

NEW YORK, April 3—Motor vehicle production for the month of March was estimated at 400,000 at the monthly directors' meeting of the National Automobile Chamber of Commerce, it was announced here today. This estimate is based on preliminary figures and is subject to revision. Production for February of this year was 339,510 units, and for March, 1929, 626,076 units.

Robert W. Woodruff, president of the White Co., Cleveland, was elected a member of the board of directors at the meeting. The directors went on record as favoring the provision introduced into the present tariff bill by the House of Representatives, which would permit the President to change the rates of certain tariffs when competitive conditions warranted.

Show Drawing Set

DETROIT, April 3—September, 1930, is the date set by the show committee of the National Standard Parts Association for the drawing for space in the sixth annual N.S.P.A. show to be held in the Cleveland public auditorium, Nov. 17 to 21, inclusive, according to Secretary R. MacFee.

Moon and Gardner Consolidate Sales

Engineering Forces Also Pooled; Companies Retain Identity

ST. LOUIS, April 2—Following New York rumors predicting the merger of the Moon Motor Car Co. and the Gardner Motor Co., both of St. Louis, it was announced today that the two companies have consolidated the sales and engineering staffs.

Each company will retain its own identity, its own physical properties, and its own financial structure, but will consolidate the designing and marketing of cars on a more economic basis.

The sales departments of the companies will market the new Ruxton front-wheel drive, the Gardner "140" and "150" eight-in-line series, the Gardner "136" six-cylinder lines, the Windsor "669" and "675" six-cylinder line, and the Windsor "892" eight-in-line, and the new Gardner front-wheel drive, displayed at the New York and Chicago shows, which will be put on the market this summer, according to Gardner officials.

F. H. Rengers, former sales manager for Gardner, will be general sales manager for the consolidated sales organization.

G.M. Earnings Forecast

NEW YORK, April 3—With due allowance for the diversification of manufactures, General Motors Corp. profits for the first quarter of 1930 probably will not decline much beyond the relative decline in sales, according to an analysis of the company's current position by Dow, Jones & Co. It is estimated that the net for the first quarter will approximate $43,000,000 after all charges and taxes, which would equal 90 cents a share on the 43,500,000 shares of common stock outstanding, after allowing for preferred dividends. This would compare with net earnings of $1.37 a share in the corresponding period of 1929.

The survey indicates also that General Motors sales for the three months would be approximately 370,000 units, compared with 523,119 in the same period of 1929, or a decline of 30 per cent. Used car stocks have been held down during the quarter, notwithstanding that they normally increase.

Inter-City Trucking Pioneers Are Lauded

N.A.C.C. Official Tells Hartford Club of Contribution to Transportation

HARTFORD, March 31—Over-the-road haulers pioneered the inter-city truck movement in Connecticut, and made a contribution to local transportation in the state, for which large shippers should be grateful, Edward F. Loomis, secretary of the Motor Truck Committee of the National Automobile Chamber of Commerce, told 500 members of the Hartford Traffic Club at its annual banquet last week.

"When the truck finds it economic level in the transportation field, the service it provides will be linked more closely to rail service than at present," Mr. Loomis declared. "At that time the railroads will undoubtedly own or control a substantial portion of trucks in the hauling-for-hire business.

"Railroads can make considerable economies in their handling of freight through greater coordination of truck and rail service. We must always bear in mind, however, that these economies usually will have resulted from the experiments of the independent truck owners in developing hauling service which has become indispensable to the public.

"In the course of the legitimate growth of truck operations by railroads, the rights of the pioneer truckman to continue in the business he is building up must be protected.

"Any attempt by railroads to drive these pioneers out of business through legislation or through unfair competition, or compel them to sell their lines for prices which do not include a fair allowance for the good will of the service they have created, should and must be resisted vigorously."

Jersey to Spend $3,000,000 on Roads

NEW YORK, March 31—The New Jersey State Highway Commission has announced a program for highway improvement during the summer of upward of 279 miles of borough and township roads, at an estimated cost of $3,119,536. Of this amount the state will pay $2,100,000.

Canadian Durant Off

TORONTO, ONT., April 2—Earnings of the Durant Motors of Canada, Ltd., showed a sharp drop in 1929, as was to be expected from general conditions in the industry. Profits were equal to $1.28 per share, as compared with $1.81 in the previous year, and $1.25 in 1927.

N.A.C.C. Supports Parker Bill

NEW YORK, March 31—Support for the Parker bill regulating motor buses in interstate commerce, as it was amended during the debate in the house, is expressed in a letter sent to Hon. James C. Couzens, chairman of the Senate, Interstate Commerce Committee, by the National Automobile Chamber of Commerce.

Russian Production May Reach 14,900

NEW YORK, March 27—The Amtorg Trading Corp. has published a book prepared by Saul G. Bron, former chairman of the board of directors, entitled Soviet Economic Development and American Business. During the 1929-30 fiscal year it is expected, according to this book, that 14,900 automobiles will be produced, including the assembly of foreign cars, as compared with 1900 in the previous year. The book mentions specifically the three automobile factories now under construction at Nizhni-Novgorod, Moscow and Yaroslavl.

Canadian Exports Recede

OTTAWA, ONT. (CTNB), March 29—Exports of automobiles in February from the Dominion of Canada amounted in value to $1,915,555. Although this figure was above January's total of $1,550,606, it represents a considerable reduction from the $4,746,289 reported in February of last year. Passenger automobiles accounted for $1,086,299. Exports during the month under review amounted to 2498 passenger cars and 1739 freight vehicles. Imports of passenger cars during the month amounted to 1586, valued at $1,348,245, while other automobiles totaled 307 with a valuation of $387,334.

New Chevrolet Introduced

DETROIT, April 2—Announcement has been made by the Chevrolet Motor Co. of the addition of a new four-door closed model, the Special Sedan, listing at $725, to its line. Features of this car are the provision as standard equipment of such de luxe equipment as six wire wheels, with the spares mounted in fender wells, large chrome-plated hub caps, arm rests, combination vanity case and smoking set, and silk assist cords.

Claims Rapid Fuel Filter

SPRINGFIELD, MASS., April 2—Gilbert & Barker Mfg. Co., of West Springfield, is getting into production with a filter tunnel for removing water and dirt from gasoline when it is delivered to an airplane. At a rate of 26 gal. a min., practically complete water recovery is attained, it is said, by this new fueling device that is being used for army and navy planes.

Ford Canadian Production Up

TORONTO, ONT., April 3—Ford Co. of Canada produced 87,504 units in 1929, as compared with 37,778 in the previous year, the output averaging about 291 cars per day.

Minimum Age Mechanic's License Set

WASHINGTON, March 31—The Department of Commerce today placed the minimum age requirement for any class of mechanic's license at 18 years, it was announced at Washington.

Financial Notes

Bendix Aviation Corp. and subsidiaries report net earnings for 1929 of $7,416,408 after all charges. This is equivalent to $3.53 a share on outstanding stock and compares with earnings of $6,166,045, or $2.94 a share, on the same basis for 1928.

Advance-Rumely Co. and subsidiaries report net loss for 1929 of $395,503 after all charges.

H. H. Franklin Mfg. Co. has declared regular quarterly dividend of $1.75 on preferred, payable May 1 to stockholders of record April 20.

Federal Drop Forge Co., Lansing, Mich., declared a cash dividend of 2½ per cent payable April 1 to stockholders of record March 26. The directors also announced the reelection of all officers of the company for another year. These officers are: M. R. Carrier, president and general manager; C. E. Bement, vice-president; R. G. Carrier, treasurer, and J. R. Whitney, secretary.

White Motor Co. and subsidiaries report net profit for 1929, after all charges, of $2,547,646. This is equivalent to $3.18 a share and compares with earnings of $1,963,761, or $2.45 a share, for the previous year.

Checker Cab Mfg. Co. has declared regular monthly dividends of 35 cents each, payable May 1 to stockholders of record April 15, June 2 to stockholders of record May 15, and July 1 to stockholders of record June 16 respectively.

Chicago Motor Coach Co. and Depot Motor Bus Lines, Inc., showed a drop in their consolidated net profit for 1929 as compared with the previous year. Last year's net profit was $361,109, against $517,349 in 1928, a decrease of $156,240. Gross earnings of the two companies showed an increase, as $6,870,136 was taken in during 1929, while the gross in 1928 was $6,232,176.

Omnibus Corp., Chicago, reports total income for 1929 of $1,006,891, compared with $929,306 the previous year. After deductions the net profit amounted to $957,549, against $879,840 in 1928. Total surplus as of Dec. 31 was $1,366,296, compared with $1,117,568. In 1929 $248,727 was added to surplus, while in the previous year $171,328 was added. Component organizations include the Chicago Motor Coach Co., Depot Motor Bus Lines and Gray Line Motor Tours Co.

Total assets were $18,781,560, compared with $18,065,586 in the previous annual period. Current assets were $1,291,958 and current liabilities $814,226, compared with $653,702 and $723,615 respectively.

Ajax Rubber Co. and subsidiaries report net loss for 1929 of $2,468,248 as compared with loss of $2,063,970 in 1928.

Reo Motor Car Co. reports net profit for 1929, after all charges, of $1,073,524. This is equivalent to 53 cents a share on stock, and compares with earnings for the previous year of $5,083,588, or $2.54 a share. After payments of dividends there was a deficit of $1,326,476, comparing with a surplus of $2,083,583 in 1928.

Gemmer Mfg. Co. has declared regular quarterly dividends of 75 cents on Class A and 30 cents on Class B stock, both payable April 1 to stockholders of record March 25.

Graham-Paige Motors Corp. has declared regular quarterly dividend of $1.75 on first preferred, payable April 1 to stockholders of record March 15.

Firestone Tire & Rubber Co. has declared regular quarterly dividend of 40 cents, payable April 21 to stockholders of record April 4.

Black & Decker Mfg. Co. has declared regular quarterly dividend of 40 cents on common and 50 cents on preferred, both payable March 31 to stockholders of record March 19.

Eaton Axle & Spring Co. has declared regular quarterly dividend of 75 cents, payable May 1 to stockholders of record April 15.

Packard Electric Co. has declared regular quarterly dividend of 65 cents, payable April 15 to stockholders of record March 31.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for AUTOMOTIVE INDUSTRIES.

NEW YORK, April 3—Unseasonable weather in some sections of the country retarded retail trade last week. General trade and industry continued below last year's levels, although wholesale and jobbing lines have been gradually gaining. Some reports indicate that unemployment increased slightly during March.

LIFE INSURANCE SALES

Sales of ordinary life insurance during February were 7 per cent above those in the corresponding period last year. During the 12 months ended Feb. 28 sales increased 7 per cent above those in the preceding 12 months.

COTTON SPINNING

Cotton spinning spindles in place at the end of February totaled 34,523,296, of which 28,926,580 were operated some time during the month, as against 29,198,134 during January and 31,008,794 during the corresponding period last year.

CRUDE OIL PRODUCTION

Average daily crude oil production in the United States for the week ended March 22 was 2,535,900 bbl., as compared with 2,583,200 bbl. for the preceding week and 2,655,600 bbl. a year ago.

FREIGHT CAR LOADINGS

Railway freight loadings for the week ended March 15 totaled 881,187 cars, which marks a decline of 77,414 cars below those in the corresponding period a year ago and a decline of 61,385 cars below those in the corresponding period two years ago.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended March 29 stood at 90.4, as against 90.7 the week before and 90.9 two weeks before.

Plan Permanent Salon

CHICAGO, March 31—Manufacturers of cars in the class of $2,500 and upward are participants in the formation in Chicago of the first permanent automobile salon in this city, and possibly in the United States. The organization, which is to be on a cooperative not-for-profit basis, has been incorporated under the name of Chicago Automobile Salon, with offices at 844 Rush Street.

German Claims Non-Spinning Plane

WASHINGTON, April 2—The development of a "Hawk," non-spinning airplane, the stability of which is said to be derived from the shape of the wing, is claimed by the Foche-Wulf Company of Bremen, according to a report received in the Department of Commerce from Berlin. The "Hawk" is a cantilever high-decked monoplane without struts with the wing over and resting on the fuselage. The wing is thick in the middle and tapers toward the back and ends. The depth of the wing tapers also toward the ends and is constructed with a single box bearer with plywood ribs. The leading edge is covered with plywood and the entire wing with canvas. In order to increase the lateral stability and to retain it when the plane is overdrawn, the ends of the wings have "Eanonia" shape.

Austin Officials Plan Visit to Russian Plants

CLEVELAND, March 31 — Fifteen officials of the Austin Co. of Cleveland, headed by G. A. Bryant, Jr., vice-president, will sail shortly for Nizhni Novgorod, Russia, according to an announcement from the Chicago offices of the company. The group about the middle of April will begin actual construction of a $50,000,000 automobile factory and model industrial city after the pattern of Detroit. More than 100 engineers and draftsmen have been busy at the Cleveland offices of the company during the fall and winter preparing plans for the project.

Most of the preliminary work will have been completed by the scheduled time of the party's arrival. This includes the dredging of the Oka River to make possible the landing of supplies, assembling of materials and erecting of quarters for the Cleveland group as well as for the 8000 workers that will be employed when the work is in full force.

Crude Rubber Steady

NEW YORK, March 31 — Fair demand and increased activity in the manufacturing centers have resulted in increased steadiness in the crude rubber market, according to F. R. Henderson Corp. Reports from the manufacturing centers indicate that employment is on the upward swing in order to step up production during April.

Stocks in London have increased to 68,404 tons and those in Liverpool are up to 21,187 tons.

Total imports during February are placed by the United States Department of Commerce at 43,075 tons and March arrivals are estimated at 42,000 tons.

N. Y. Air Show Opens May 3

NEW YORK, April 2—With 110 exhibitors granted space for the New York Air Show, sponsored by the Aeronautical Chamber of Commerce at Madison Square Garden May 3 to 10, the exposition will be the largest ever held in the East, Charles L. Lawrance, chairman of the show section, announced.

Names Airplane Service Station

NEW YORK, March 27—Air Associates, Inc., has been appointed a New York authorized service station for engines manufactured by the Pratt & Whitney Aircraft Co. of Hartford.

Automotive Construction and Tool Sales Are Down

Recession Shown in Reports From Industrial Centers for This Week

PHILADELPHIA, April 3—Automotive construction projects and machine tool sales throughout the country showed a slight recession this week as compared with last week, according to *Automotive Industries* correspondents, reporting from major industrial centers of the country.

Among the contemplated projects reported this week were:

I. Kallich, Brooklyn, architect, has revised plans for automobile service, repair and garage building on Quentin Road, to cost about $100,000 with equipment.

Wm. L. Hohanser, Inc., New York, architect, will soon take bids on general contract for automobile service, repair and garage building, to cost about $150,000 with equipment.

O'Connor Transatlantic Airways, Inc., New York, planning construction of new terminal on City, Island, including hangars, repair shops, oil storage and other field units to cost over $500,000 with equipment.

Ford Motor Co., Dearborn, Mich., is awarding sub-contracts for work for new assembling plant at Edgewater, N. J., to cost over $1,500,000 with machinery. General contract has been let to Turner Construction Co., New York. Albert Kahn, Inc., Detroit, architect and engineer.

Providence Cadillac Co., Providence, R. I., has filed plans for service, repair and sales building, to cost about $200,000.

Packard, Inc., Philadelphia, plans a service, repair and sales building at Broad St. and Allegheny Ave., to cost about $300,000 with equipment. Philip S. Tyre is architect.

Fairfax Airports, Inc., St. Joseph, Mo., operating airports in Kansas and Missouri, disposing of stock issue to total $370,000 part of fund to be used for expansion.

The Marquette Tool & Mfg. Co., which recently announced the lease of a large ground area in the Clearing Industrial District, with plans for the construction of a new manufacturing building there, has in turn subleased the premises which the company now occupies at 4500 Cortland St. to the General Transformer Corp. of America. The plant embraces 20,000 sq. ft. of floor space and the sublease is for 20 years at a total rental of $73,000.

St. Louis Airport Commission, St. Louis, plans municipal airport, to cost about $2,000,000 including hangars, repair and reconditioning shops, terminal buildings and other units. B. Russell Shaw Co. airport engineer, in charge.

C. & C. Battery Mfg. Co., Houston, Tex., plans early production of electric storage batteries and kindred equipment in new plant now being completed.

Austin & Virtue, Columbus, Ohio, architects, will soon take bids for an eight-story automobile service, repair and garage building, to cost $180,000 with equipment.

Automotive Foundries, Inc., La Crosse, Wis., is awarding contract for a machine shop extension costing about $30,000.

Snow-Flyer Co., New Holstein, Wis., manufacturing crawler and runner attachments for automobiles, trucks and tractors, will start work April 1 on addition to machine shop, assembly room and shipping department. Investment will be about $50,000.

Firestone Tire & Rubber Co., Akron, Ohio, is planning factory branch and distributing plant at Detroit, to cost over $80,000 with equipment.

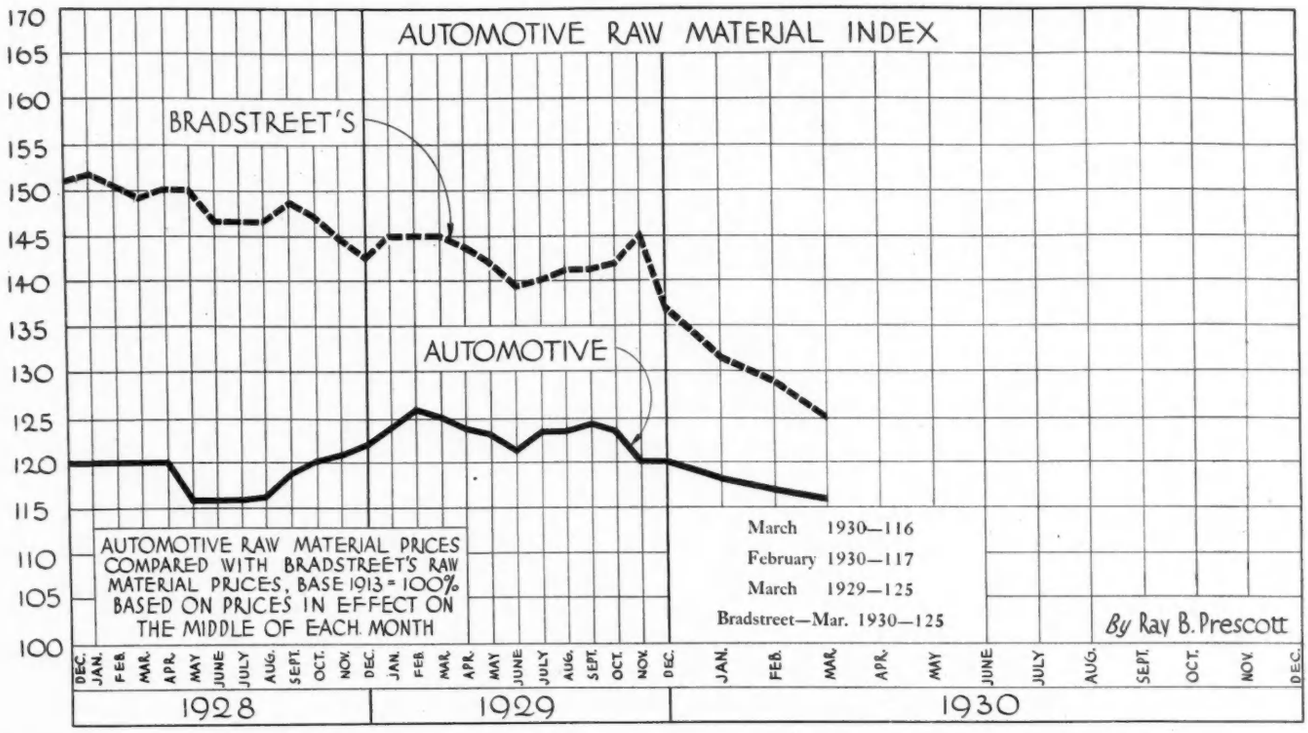
Briggs Mfg. Co., Highland Park, Detroit (automobile bodies), will develop a new department for production of metal stampings for automotive service.

Consolidated Aircraft Co., Bridgeburg, Ont., has awarded contract to Austin Co., Cleveland, for a manufacturing plant, boiler house and hangar to cost $60,000.

Seeks Compulsory Insurance

TORONTO, ONT., April 2—All motorists who are convicted of a charge arising out of an accident will be forced to take out liability accident insurance, if a bill that is being introduced in the Ontario legislature should be passed.

Raw Material Index Drops One Point



Packard Official Tells of Production Control

DETROIT, March 29—M. A. Cudlip, vice-president and secretary of the Packard Motor Car Co., presented a paper, "The Level Production Plan," outlining the production program followed by his company, at the Mid-West Savings Conference here March 27.

The Packard plan, as explained by Mr. Cudlip, calls for the approximating of the year's production in advance and following a program over the 12 months along as nearly level a course as possible.

It entails the determination of the maximum and minimum stock of cars the company wishes to have on hand. Mr. Cudlip's paper also described the Packard Aid Association and the Packard Senior League, organizations formed for the benefit of its employees.

Buick Appoints Kurtz

DETROIT, April 2—E. T. Strong, president and general manager of the Buick Motor Co., yesterday announced the appointment of R. L. Kurtz, for past ten years assistant general purchasing agent, as general purchasing agent to succeed George G. Allen, who has just retired after 14 years of service with the company.

William J. Brewer, assistant purchasing agent, becomes assistant general purchasing agent.

Mr. Kurtz completed an engineering course at Michigan State College in 1909 and joined the Weston-Mott Co. as draftsman, with which company he advanced to the positions of head of experimental engineering and executive in the cost department and head of the follow-up division of the purchasing department.

He joined Buick when that company absorbed Weston-Mott. Mr. Brewer has been with Buick 17 years and has been assistant purchasing agent for past 11 years.

The retiring executive, Mr. Allen, announced that he will continue his residence in Flint.

Italian Motor Vehicle Registrations Gaining

ROME, April 2—According to figures gathered by the Central Statistical Institute, the number of motor vehicles in service in Italy increased from 116,722 in 1923 to 324,747 in 1929. The number of motorcycles increased from 39,915 to 78,772.

Passenger cars increased from 53,755 to 173,342, to which latter figure must be added 7928 motor buses. Auto cars increased in number from 21,785 to 49,339, while on August 31 last there were also 653 road tractors and 8437 trailers.

Special attention is called to the number of agricultural tractors, as it was not necessary to register these up to April 30 last. At the end of August 6376 farm tractors were in service in Italy.

It is pointed out that these figures have a double significance. In the first place they show the rapid mechanization of road transport, and secondly, they show the importance to Italian industry of producing all of the different types of vehicles, the use of which is destined to increase more and more.

Detroit Aircraft Show Today at City Airport

DETROIT, April 2—Eighty-one airplanes inside the exhibition building at Detroit's municipal airport, 51 demonstrators on the airport field and 121 exhibitors of engines and accessories, will represent the aircraft industry Saturday at the opening of All American Aircraft Show.

While the number of planes inside the building is less than last year, the floor space required for their exhibition is larger, there being more transport craft than previously shown, including three Fords and two Fokkers, including the F-32.

Leading in interest are the Packard Diesel, described elsewhere in these columns, and the lower prices on several important lines of planes including the Curtiss Wright group and the Stinson Transport at less than $24,000.

Ford Turkish Plant Rumored

ANGORA, March 30—Local newspapers announced here that the Ford Motor Co. intends to open a tractor plant at Constantinople in the near future, receiving in return a concession to operate a mine at Bayuk-Ada. Mr. Ford himself, according to report current here, will visit Turkey in June.

American Air Filter Formed

LOUISVILLE, April 1—The Reed, Midwest and National Air Filter organizations, of this city, were consolidated today under the name of American Air Filter Co., Inc. The latter was formerly holding company for the former concerns.

Automotive Steel Demand Increased, Mills Report

Quotations Are Steady, But Concessions Appear

NEW YORK, April 3—Current automotive demand for steel was stepped up another notch this week, operating rates of finishing mills gaining moderately. The scramble by individual producers for the largest possible slice of current demand has turned keener.

Quotations have undergone no alteration, but in some descriptions of finished steel concessions have become so general that full prices apply only to very small lots.

Hot-rolled strip steel has been selling freely at 1.85 cents, Pittsburgh, for strips 6-in. and under and at 1.75 cents for over 6-in. to 24-in. This is $1.00 a ton under what has heretofore been considered the market.

Demand for hot-rolled strip has broadened. Inquiry for cold-rolled is still slow, with the undertone of the market naturally weak because of the paucity of business as well as the situation in the hot-rolled market.

A good deal of business in small tonnages has come out in sheets. Prices are nominally unchanged, but there is said to be much shading. In the Chicago market round lots of steel bars are now held at 1.90 cents, which reflects concessions to bring out business.

Automotive alloy steel specialists report somewhat better takings, with the market fairly steady. Non-integrated sheet rollers are calling for semi-finished steel as they need it, without worrying very much about second-quarter contracts. They experienced no difficulty in covering much of their first quarter needs on this basis, and apparently do not consider conditions as having materially changed.

Pig Iron—Much of the buying by Middle West automotive foundries is still on a hand-to-mouth basis. The rate of melt, however, is on the uptrend. The leading seller in the Chicago district quotes the second quarter price for No. 2 foundry unchanged at $19.50, Chicago, and calls reports of sales under that price as unfounded. Valley, Cleveland and Detroit markets are unchanged.

Aluminum—Somewhat more demand from automotive consumers is reported. Aluminum pistons are moving in better quantities. Inquiry from airplane manufacturers is promising. Prices are unchanged.

Copper—Export demand continues to be the market's chief prop. The price remains pegged at 18 cents, delivered Connecticut, and 18⅛ cents, delivered Middle West.

Tin—American deliveries in March aggregated 8675 tons, the third heaviest tonnage ever delivered in any one month. Authorities say that actual consumption has been running at about 6500 tons a month during the first quarter. The Straits market opened the week at 38 cents.

Lead—Storage battery manufacturers are among the most active buyers of lead. The market has turned firm.

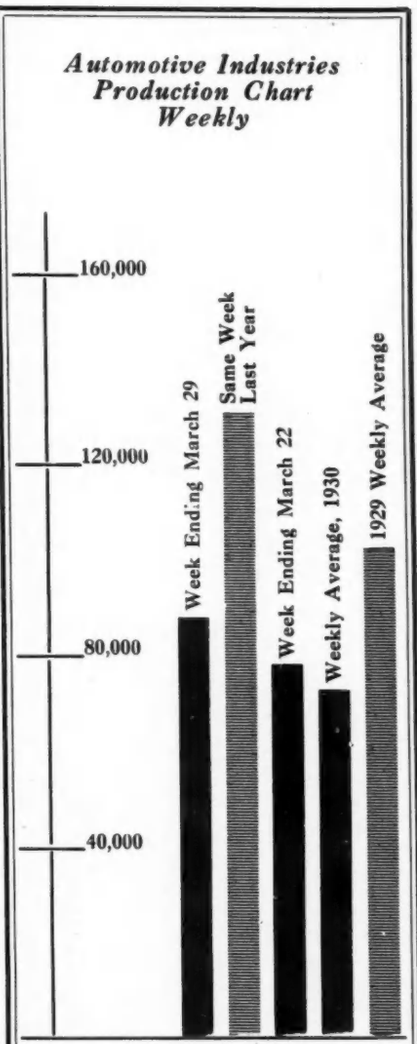
Zinc—There is more talk of curtailment of mine output. The price of zinc ore has declined $2.00 a ton, but the metal is holding at 4.85 cents, East St. Louis, at which price smelters are hardly breaking even.

Appleton Tube Sale Ordered

MILWAUKEE, March 31—H. W. Tuttrup, receiver for the Appleton Steel Tubes Co., Appleton, Wis., has been directed by the Circuit Court at Appleton to offer the entire property for sale at public auction on Monday, April 28. The company, which specialized in automotive tubing, ceased production in December and did not contest a receivership action in the state court, the directors filing a statement that the company was unable to meet its obligations.

Welding Process Discussed

MILWAUKEE, March 31—The April meeting of the Milwaukee Section, S. A. E., on Wednesday, April 2, is being devoted principally to the electrical welding process as developed by the A. O. Smith Corp. In the afternoon, at 3, the members and guests will inspect the mammoth Smith plant, later going to the Milwaukee Athletic Club for the usual 6.30 dinner. At the business meeting at 8, Prof. T. McLean Jasper, director of research for the Smith corporation, will present a paper on "Electric Welding, Its Application and Possibilities in the Automotive Industry."



The composite chart appearing above will delineate each week production of passenger cars in the United States and Canada, for the week preceding publication of the issue in which it appears, together with production for the preceding week, and other factors. Data used in compiling it are obtained in confidence from a number of sources. Other factors may be added, dependent upon the cooperation of additional sources of information.

Eaton Axle-Wilcox-Rich Consolidation Proposed

Merger to be on Stock Exchange Basis

DETROIT, April 2—Terms and the proposed consolidation of the Eaton Axle & Spring Co. and the Wilcox-Rich Corp. have been agreed upon by board of directors of both companies, it was announced yesterday.

Holders of Wilcox-Rich Class B stock are offered eighty-five one-hundredths of a share of common stock of Eaton Axle for each share of Class B Wilcox-Rich stock. The offer remains open until May 10 or may be extended for a period of not longer than 60 days thereafter.

The exchange shall be declared effective when not less than 200,000 shares of the outstanding 368,620 shares of Class B stock shall have been deposited. The 64,028 shares of Wilcox-Rich, $2.50 cumulative dividend Class A stock will remain undisturbed. Dividends on Eaton Axle common are now being paid at the rate of $3.00 per share per annum and on Wilcox-Rich Class B stock at rate of $2.00 per share per annum, so that the holder of one share of the latter stock will, by making the proposed exchange, increase his cash dividend return to equivalent of $2.55 per share per annum on his old stock.

The Guardian Trust Company of Detroit, and Bankers Trust Co., New York, will be depositories for the exchange and will issue transferable certificates of deposit to the depositing stockholders.

It is understood that application will be made to list such certificates upon the New York Stock Exchange. A complete exchange for all outstanding Class B stock will necessitate issuance of 279,327 additional shares of Eaton Axle common, which would bring the total outstanding to 579,327 shares.

Preliminary figures of the combined net earnings of the two companies for the year ended December 31, 1929, after all charges, including Federal taxes, are $2,901,716.

Albert C. Weber, Jr.

DETROIT, April 2—Albert C. Weber, Jr., 23-year-old assistant secretary and treasurer of the Pontiac Pattern & Engineering Co., and son of vice-president of the Wilson Foundry & Machine Co., died March 29, a week following an operation for gastric ulcers.

To Exhibit Sun Compass

NEW YORK, April 3—Pioneer Instrument Co., a division of Bendix Aviation Corp., will have an exhibit at the Third All-American Aircraft Show in Detroit, a Bumstead sun compass similar to that used by Rear Admiral Richard E. Byrd in his South Pole flight.

Ajax Production Resumed

RACINE, Wis., March 31—The Ajax Rubber Co. of this city resumed production during the past week and by the close of the present week expects to be operating at practically a normal rate with a force of upward of 350.

Men of the Industry and What They Are Doing

Cutter Resigns From U.S. Rubber After 14 Years

William O. Cutter, director, member of the executive committee and vice-president of the United States Rubber Co., has resigned and is sailing tonight for an extended trip abroad for rest and recreation, according to announcement made by F. B. Davis, Jr., president of the company.

Mr. Cutter has been with the company for 14 years in various capacities in the departments of accounts and finance, and was for a number of years comptroller.

Manages Ford Advertising

Ellis F. Millard has been appointed advertising manager of the Ford Motor Co. of Canada, Ltd. He joined the company in 1919, starting in the accounting department. Later he was transferred to the auditing department, where he became traveling auditor and then head of the branch auditing division.

Packard Electric Promotions

The Packard Electric Co. announce the following reorganization of the executive force at their home office in Warren, Ohio. B. N. MacGregor, heretofore sales manager in direct charge of all divisions, has been advanced to the position of general sales manager.

Gordon S. Carr has been appointed sales manager of the manufacturer's division.

J. S. Francis has been brought into Warren from the Cleveland territory, and made sales manager of the jobbing division.

H. C. Mohr has been advanced to the position of advertising manager.

R. J. Montgomery, formerly in the Chicago district, has been made sales promotion manager with headquarters at Warren.

L. C. Wolcott has been made aviation division engineer in charge of the aviation.

Francis A. Nealon, previously with the Cleveland district office, has been made supervisor of dealer contact.

Will Tour Europe

Frank L. Hambly, export manager of the Marmon Motor Car Co., has sailed for Cherbourg, France, as the first step of a two months' tour of Europe during which he will visit practically every important automotive distributive point and make an intensive survey of business conditions abroad.

Heads Autocar Branch Sales

E. F. Sayres has been appointed assistant sales manager in charge of branch operations by H. M. Coale, vice-president in charge of sales of the Autocar Co., Ardmore, Pa.

Promoted

Clarence E. Eldridge, whose appointment as assistant to the general manager of the Reo Motor Car Co., in charge of general assignments, was announced last week in Automotive Industries, has been with the organization 13 years

Budd Sails for Europe

Edward G. Budd, president of the Edward G. Budd Mfg. Co. and the Budd Wheel Co., sailed March 8 on the Berengaria for Europe where he will visit the plants with which his companies are affiliated, in England, France and Germany.

Name Manager for Toronto Franklin

H. W. Dane has been appointed wholesale manager for the Franklin Wilson Motors Company of Toronto, Canada. Mr. Dane's experience in the automobile business is unusually diversified. He was for four years connected with the wholesale and retail department of the Cadillac distributor in Toronto. Prior to that Mr. Dane was sales manager for Buick in Niagara Falls and at one time had a General Motors franchise in a Canadian city.

Peerless European Director Sails

Coldwell S. Johnston, European director of the Peerless Motor Car Corp., sailed recently on the S. S. Aquitania for England, where he will make a brief survey of the automotive field. He will proceed then to his continental headquarters in Paris.

Elect Philadelphia Manufacturer

The Electric Hoist Manufacturers Association, meeting at the William Penn Hotel, Pittsburgh, March 20, elected Joseph G. Worker, American Engineering Co., Philadelphia, as chairman, and D. S. Brisbin, Chisholm-Moore Hoist Corp., vice-chairman.

Joins Auburn Subsidiary

Roy Carnovsky, formerly in charge of production at Plant No. 18, Fisher Body Corp., Detroit, has been named superintendent of production of the Limousine Body Co., Kalamazoo, a subsidiary of the Auburn Automobile Co.

Australian Plans Study of Advertising Methods

A. E. Plant, president of the Chamber of Automotive Industries of New South Wales, comes to the United States in May to study automotive advertising and publicity and the merchandising of commercial vehicles. He will sail from Sydney on May 1 and expects to arrive in New York on May 31. He will spend a week here and sail on the Laconia on June 7 for England.

Plans European Campaign

E. S. Spencer, president of the Stromberg Electric Co., Chicago, sailed March 31 for Europe, where he will spend two months arranging for sales representation for the Stromberg line of time-recording devices. The importance of dependable time-control methods, he said, is being recognized as a business necessity by European industries. He intends to visit London, Paris, Berlin, Stockholm, Milan, Italy, and Zurich, Switzerland.

Named Head of Color Study

W. A. McNabb, formerly of Detroit art studios and more recently with the General Motors Corp., is in charge of the study of the value and effects of colors on Franklin automobiles at the Syracuse, N. Y., plant.

Heads American Metal Sales

R. F. LaMothe, formerly with the Waukesha Motor Co. of Waukesha, Wis., is now sales manager for the American Metal Products Co., Milwaukee, Wis.

Joins Auburn Research

W. M. Scarth, formerly assistant specification engineer of General Motors of Oshawa, Canada, is now assistant research engineer with the Auburn Automobile Co.

McAneeny Back in Detroit

William J. McAneeny, president of the Hudson Motor Car Co., has returned to Detroit after an extended stay in Palm Beach, Fla.

Joins Aircraft Board

Fred W. Gardner, executive vice-president of the Gardner Motor Co., Inc., St. Louis, has been elected to the board of directors of the Detroit Aircraft Corp.

Gets Committee Secretaryship

Richard S. Armstrong has been appointed secretary of the Motor Vehicle Conference Committee. Mr. Armstrong has been acting in this capacity for several months and has been assistant secretary for some time.

"Care Will Save" Slogan to Open M.E.A. Campaign

Maintenance Program to Begin May 10 With Publication and Radio Advertising

CHICAGO, April 2—One of the most extensive programs ever undertaken to interest the country's 25,000,000 automobile owners in the value of regular car maintenance is ready to be launched by the Motor and Equipment Association. The campaign opens officially with a double-page announcement in the May 10 issue of the *Saturday Evening Post.*

Built around the basic message—"Care Will Save Your Car" the campaign will point out to car owners reasons for visiting their garage or service stations at regular intervals for inspection and maintenance service.

Automotive dealers, garage owners and service station operators will be identified with the campaign through jobbers who are members of the M.E.A. and they will be supplied with materials which will aid them in merchandising their services to the car-driving public.

"Our program is designed to impress upon the car owners the many services available in their own community for keeping their cars in first-class shape at all times so that they can get the greatest amount of value out of them," said B. W. Ruark, sales development manager of the association. "In doing so we feel that we will be making a distinct contribution to the industry. President J. M. McComb, has pointed out that a campaign of this kind will even help to stabilize the used car market."

The magnitude of the association's advertising will be increased greatly by the use of radio and by arrangements which call for the use of the official campaign banner in the advertising copy of manufacturer and jobber members in national and trade publications. A number of members now using radio advertising are planning to include the "Care Will Save Your Car" idea in their programs.

Plan Founders Session

ST. LOUIS, March 28—At a meeting held at the Statler Hotel here yesterday, at which Burtner Fleeger, Oklahoma Steel Castings Co., Tulsa, Okla., presided, the Steel Founders' Society discussed ways and means for better serving the industries of America. F. J. Stanley, Michigan Steel Casting Co., Detroit, and others, advocated even greater cooperation with designers and engineers of the companies to whom the steel foundries sell, lending assistance and giving such suggestions as will enable the customer to secure the maximum advantage and service from the steel castings he buys.

The next meeting of the society will be held at Hotel Hollenden, Cleveland, on May 13 and 14, in conjunction with the convention of the American Foundrymen's Association.

Congratulations

Automotive Industries felicitates Walter P. Chrysler, whose birthday occurred Wednesday of this week

Bendix Position is Stronger

CHICAGO, April 3—Revealing a current position of better than six to one and cash and marketable securities alone 5.8 times the total of current liabilities, the first annual report of the Bendix Aviation Corp. was made to stockholders by Vincent Bendix, president.

Total current assets as of Dec. 31, 1929, amounted to $25,573,141 against current liabilities of $3,542,312. Cash, call loans and marketable securities totaled $18,002,528. Total assets were $70,986,235.

Net income for 1929 after all charges and taxes amounted to $7,416,408, equivalent to $3.53 a share on 2,097,454 shares of common stock. Report of the corporation to the New York Stock Exchange for the year ended Dec. 31, 1928, including Stromberg Carburetor Co., Eclipse Machine Co., and Scintilla Magneto Co. and their respective subsidiary companies, showed net income of $6,166,045, equal to $4.44 a share on 1,390,000 shares of capital stock.

Eugene Maxwell Moore

NEW YORK, April 2—Eugene Maxwell Moore, vice-president and a director of Manning, Maxwell & Moore, Inc., New York, died on March 27 after a brief illness. Mr. Moore, who was 39, was a brother of Charles Arthur Moore, president, and was a son of Charles Arthur Moore, one of the founders of the machine tool building company.

Publishes Airplane Parts List

NEW YORK, March 29—Curtiss-Wright Flying Service has published a catalog listing various aeronautical parts and equipment handled by its branches throughout the country.

Chevrolet to Build Cars in Luton Vauxhall Plant

British Subsidiary Says 70 Per Cent of Labor and Materials Will Be English

LONDON, April 2—General Motors, Ltd., announced that Chevrolet trucks for the British market will be manufactured at the Vauxhall plant at Luton, in which General Motors Corp. has held a controlling interest for some years past. Vauxhall cars will continue to be produced, additional buildings and other facilities having been provided for Chevrolet production. Approximately 70 per cent of the cost of the Chevrolet chassis will be made up of British labor and materials, or, with body work, 75 per cent, but these percentages will increase rapidly each month. It is understood that Chevrolet cars will also be produced at Luton in due course, the plant there displacing the one at Hendon (London) now devoted mainly to the assembly of imported components and the production of body work.

Gabriel Changes Name

CLEVELAND, April 2—The Gabriel Snubber Mfg. Co. of Cleveland has changed the name of the business to the Gabriel Co. The business has grown to include Gabriel Triple-Vane Hydraulic Shock Absorbers, Gabriel-Anderson-Ajax Steel Spring Covers and Gabriel Gages, a new dashboard indicator which tells when the car needs oil and when the battery needs water.

Budd Enters Aviation Field

PHILADELPHIA, April 2—The Edward G. Budd Mfg. Co., Philadelphia and Detroit, is in production on its first order for ribs for airplane wings. These ribs are made of stainless steel. electrically welded.

The characteristics of this design are light weight, great strength, durability and freedom from fatigue and deterioration, according to the company. The ribs are designed in such a way as to be suitable for quantity production.

Says Auburn Stocks Are Low

AUBURN, IND., April 3—New cars in the hands of Auburn dealers on March 25 averaged approximately only 2.1 cars per dealer, despite the increased demand, R. H. Faulkner, vice-president of Auburn, reported.

Fokker Holds Driveaway

NEW YORK, March 29—Two Fokker F-32 monoplanes took off yesterday from Teterboro Airport on a flying trip West for delivery to the Western Air Express. The two planes carried 27 passengers in addition to their crews. They will stop at several places en route for demonstration purposes.

Johns-Manville Reelects

NEW YORK, March 29—Johns-Manville Corp., at the regular stockholders' meeting yesterday, reelected all retiring directors.

Aircraft Concern Formed With $500,000 Capital

Major Lamphier Heads Issoudun Company; Plans Amphibions

DETROIT, March 29—Formation of the Issoudun Aircraft Co., with a capitalization of $500,000, which will begin production of a twin-motored amphibion plane within the next few weeks, was announced yesterday by H. J. Hirzel, secretary of the company. Major Thomas G. Lamphier, former commandant at Selfridge Field, and associate of Col. Lindbergh, is president of the company.

A. C. Hamilton, designer of the ship, is vice-president. Directors include Col. Henry Breckenridge, personal attorney for Lindbergh, Harry R. Graham, Charles D. Ferguson and Fred R. Hegwood. There will be no public stock offering, Mr. Hirzel explained.

It has been announced that Col. Lindbergh is not interested in the company, although he is expected to arrive here soon to fly and inspect the plane. Production is to be started at the old Stinson airplane factory, Northville, Mich., as soon as installation of equipment is completed.

The plane is to be displayed for the first time at the Aircraft Show here next week. It is a four-passenger amphibion, powered by two Warner engines of 110 hp. each. The plane is all-metal except that the wings are fabric covered. Mr. Hamilton, the designer, is a veteran in the aviation industry, and flew planes more than 20 years ago in contests against George White, Farman, Hoxley, Bleriot, and others.

Berlin Show Date Set

BERLIN, April 2—The German Automobile Manufacturers Association has set the date for the next Berlin automobile show for Nov. 6 to 16. It is planned to make it the most important exposition of the kind in Europe and in addition to the two large exposition halls already in existence, new buildings specially designed for exposition purposes will be erected on the Kaiserdamm and fitted with all of the latest equipment for such structures. The show will cover passenger cars, trucks, buses, motorcycles and accessories. In view of the importance of proper housing facilities, a special section will be devoted to the Modern Garage. There is said to be also some question of combining an aircraft section with the automobile show.

David P. Thompson

CHICAGO, April 2—David P. Thompson, assistant to the president and a director of the Inland Steel Co., Chicago, died on March 24 at Miami Beach, after a short illness. He went to Florida only a week before his death, and contracted a cold shortly afterward. Pneumonia developed.

After graduating from Andover Academy and Yale University, Mr. Thompson entered the employ of the Republic Iron and Steel Co., later becoming president of the Sharpesville Furnace Co. of Sharon, Pa. He joined the Inland company in 1912 and at the time of his death was assistant to the president, in charge of operations.

Sharp Recovery in Automotive Advertising Linage Is Shown in 71 Cities for February, Records Show

NEW YORK, April 2—Automotive advertising in 209 daily and 118 Sunday newspapers, published in 71 cities of the United States, came back smartly in February, according to Editor & Publisher. Figures were compiled by Media Records, Inc. All newspaper linage ran 7.4 per cent behind in February, 1929.

Automotive linage losses in January were 25.3 per cent daily, and 24.1 per cent Sunday. February saw the daily loss cut to 3.5 per cent, although the Sunday loss dropped only to 23 per cent.

Classified advertising greatly improved its showing over January, for which month its losses were 10.3 per cent daily and 16.5 per cent Sunday. The February decline was 7.3 per cent daily and 10.7 per cent Sunday.

Local advertising did not hold its levels so well in February as in January. Post-holiday sales in many cities kept daily local advertising within 1 per cent of the January, 1929, volume and Sunday local within 10.4 per cent of the previous January. In February, local display declined 4.8 per cent in the daily issues and 12.1 per cent Sunday.

National advertising losses averaged a little more than 4 per cent in January, but increased to 7.5 per cent daily and 8 per cent Sunday in February.

Legal advertising continued to show notable gains, both daily and Sunday, principally because of advertising of projected public works and to some extent because of foreclosure advertisements—aftermath of the real estate boom of three and four years ago.

The loss in total is only slightly larger than in January, 7.4 per cent against 6 per cent. Total daily advertising dropped 5.8 per cent, against 4.4 per cent in January, and total Sunday advertising declined 13.3 per cent against 13.2 per cent in January.

Total gains and losses were distributed by classifications, as follows:

	DAILY		SUNDAY	
	Gains	Losses	Gains	Losses
Local Display.....	24	46	12	56
National Display ..	10	61	19	49
Automotive	29	42	7	61
Financial	26	45	22	46
Classified	20	51	11	57
Legal	39	32	31	29

In connection with this analysis, it might again be mentioned that the Media Records breakdown is followed in the above comparisons and in the summaries printed below, except for New York and Chicago. By this system, local display advertising is defined as the advertising of a retail merchant; national advertising is defined as the advertising of a product; automotive advertising and financial advertising coming wholly within neither of these definitions, are set up distinct from both. In no case is the definition of local or national advertising governed by the manner in which a publisher is paid for any piece of copy.

The New York and Chicago figures were supplied by the Advertising Record Co. Its breakdown, while showing automotive and financial advertising in separate columns, includes them also partially under local and partially under national display. The New York and Chicago figures, not being comparable with those of the other cities, are not included in the summary and comparisons based thereon.

Binks Sees Big Year

CHICAGO, April 3—The Binks Mfg. Co. looks forward to an excellent year and anticipates an increase in profits over 1929, according to Neil C. Hurley, president. Substantial operating economies have been effected and March business, he said, is running considerably ahead of a year ago. The factory is operating at capacity.

Jefferson Adds Equipment

CHICAGO, April 4—Jefferson Electric Co. is completing the installation of more than $100,000 worth of labor-saving machinery in its two Chicago plants, all of which will be ready for use before the company reaches its peak season of operation, J. A. Bonnan, president, announced. Most of the new equipment has been developed by Jefferson engineers.

Waukesha Bookings Gain

CHICAGO, April 3—The Waukesha Motor Company of Waukesha, Wis., has orders booked for the next four months which are fully as large as the total filled during the same four months of 1928, the company's record year, according to S. A. Perkins, vice-president.

"March production is running about 10 per cent above the corresponding month of last year, and considerably ahead of both January and February of this year," Mr. Perkins said. "As a result, we are operating on an overtime basis to take care of the increased business.

"We are not only certain of an increased 1930 production, but are laying our plans for the next two or three years. The company has several large contracts on hand that call for deliveries during the next few years. Improved machinery which we have put in operation enables us to produce greater results with fewer employees and at less cost. Last year was a mass production year, while 1930 is going to be an efficiency year."

Small Armstrong Siddeley Offered With Four Speeds

Optional Transmission Announced for 15 hp. 117 cu. in. Car

LONDON, April 2—A new 15 hp. six cyl. side-valve Armstrong Siddeley was announced here recently. It has a piston displacement of 117 cu. in. In engine dimensions and general layout it resembles the 15 hp. model that has been produced for two years past, but the design varies appreciably in detail, notably in the engine and rear axle. The car is offered with an optional four-speed "self-changing" (planetary type) gearset, which has pre-selective control by means of a small lever over the steering wheel center. This costs £40 extra, the standard transmission being a three-speed gearset formed as a unit with the front end of the torque tube. With the standard gearset, prices of the new car are: fabric sedan £385, metal sedan £410, these prices including Triplex glass for the windshield and centralized chassis lubrication.

Borg-Warner Volume Gains

CHICAGO, April 3—Business volume of the Borg-Warner Corp. has steadily increased since Jan. 1, and each month thus far in 1930 has shown an improvement over the preceding period, C. S. Davis, president, told stockholders at the annual meeting today. "April, from present indications, will continue to reflect this tendency and I believe the improvement will be continued throughout the coming quarter," he said.

"Although the total volume of automobile business in the first quarter of 1930 is less than that of the abnormal first three months of last year," Mr. Davis said, "Borg-Warner Corp. is receiving a greater proportion of the total business available, which indicates a strengthening of the corporation's position in the industry. With one exception, Borg-Warner is now manufacturing one or more complete parts units for every automobile produced in quantity in the United States.

"Increasing tendency on the part of automobile manufacturers to turn parts manufacturing over to parts specialists makes the outlook for the year good."

Automotive Brevities

Waukegan Chemical Co., North Chicago, Ill., announces that it has changed its name to the Brevolite Racker Co. There is no change in the management or ownership.

Stewart Motor Truck Corp., Buffalo, N. Y., announces that all models of Stewart trucks can be equipped with cup-type balloon tires at an increased cost.

The Fafnir Bearing Co., New Britain, Conn., has announced the adoption of a new type pin for the frame eyes of ball bearing spring shackles. It will permit the installation of ball bearing shackles without the aid of special equipment.

The Fafnir Bearing Co., New Britain, Conn., announces the appointment of the Rose-Hoskins Supply Co., Houston, Tex., as distributor for Fafnir transmission.

Ford passenger cars and trucks accounted for 58 per cent, 63 per cent, respectively, of registrations in Wayne County, Michigan, during February, according to an announcement from the Ford Motor Co.

Cleveland Punch & Shear Works Co., Cleveland, Ohio, has announced that its Detroit district office is now located at 4259 General Motors Bldg., Detroit. R. S. Howell is in charge.

Wm. G. Harvey Co., 540 First Trust & Deposit Bldg., Syracuse, N. Y., and 307 Crosby Bldg., Buffalo, N. Y., has been appointed sales representative in the respective territories for the complete line of the Modern Tool Works Division of the Consolidated Machine Tool Corp. of America, Rochester, N. Y.

Chicago Pneumatic Tool Co., New York, has opened branch offices in Oklahoma City, Okla., Tulsa, Okla., and Houston, Tex. Service stations and warehouses have been established at Oklahoma City and Houston.

A Duesenberg cabriolet has won two first prizes at European rallies. The Grand Prix gold medal of honor was awarded at the Pau automobile rally on the Riveria, and the second prize at the Cannes competition.

Olds Motor Works has announced that all small parts of Oldsmobiles exposed to the weather are now being rustproofed by a chemical process.

M. E. A. has removed its Chicago offices to the Daily News Bldg., 400 West Madison Street, from 35 East Wacker Drive, Chicago.

A. A. A. Contest Board has announced that a Cummins Diesel engine car will be permitted to enter the Indianapolis Speedway races on Memorial Day on an experimental sanction.

Chassis Lubricating Co., Inc., Rahway, N. J., has announced that for the first time discounts will be available for chassis manufacturers on a Myers magazine oiling system.

Champion Spark Plug Co., Toledo, announces that a second Dressler kiln has been completed and is now in operation in the plant of the company at Detroit.

Paasche Air Brush Co., Chicago, is now celebrating its Silver Jubilee Anniversary.

Packard Plans to Exhibit Diesels

DETROIT, April 2—Three airplanes are definitely scheduled to be exhibited, equipped with Packard Diesel engines at the All-American Aircraft Exposition in Detroit beginning April 5. These are the Verville Air Coach, the Stinson Junior and a Ryan Foursome. Information from Verville Aircraft indicates that with the Diesel engine the Air Coach has a top speed of 130 miles an hour, while a land speed of 50 miles an hour is claimed.

Schlee-Brock to Distribute Skylarks

DETROIT, April 2—The entire national distribution of the Driggs Skylark has been taken over by the Schlee-Brock Aircraft Corp. of Detroit. The Skylark, designed by Ivan H. Driggs, is manufactured by the Driggs Aircraft Corp. of Lansing.

Tests Motor Glider

DAYTON, OHIO, April 2—A new type of aircraft, a motor glider "Buzzard," has completed a series of tests at the Johnson flying field, here. The "Buzzard," a product of the Motor Gliders, Inc., is a motor glider or a light monoplane and is powered by a two-cylinder A.B.C. air-cooled, 112-lb. Scorpion engine. The builders say it will be under $2,000.

Duesenberg Exports Are Strong

CHICAGO, April 2—Duesenberg, Inc., subsidiary of the Auburn Automobile Co., has received approximately $250,000 in foreign orders since Dec. 1, 1929, the beginning of the fiscal year, according to H. T. Ames, vice-president. The company now has fifteen export accounts, including the National Automobile of Madrid, which, Mr. Ames expects, will place orders totaling more than $460,000 in the near future.

Libbey-Owens and Ford Glass Interests United

$65,000,000 Merger Shows Influence of Automobile Manufacturers

DETROIT, March 29—Negotiations uniting the Edward Ford Co. and the Libbey-Owens Co., both of Toledo, were completed yesterday. The combined value of the securities involved in the transaction aggregates $65,000,000. The interests heretofore have been non-competitive

The Ford concern, represented by J. B. Ford of Detroit, and George Ford of Toledo, manufactures plate glass for building construction. Libbey-Owens has been turning out small plate glass.

The latter company is directed by J. C. Blair, president, and represents the interests of the Graham brothers, the Solvays, of Belgium; Marshall Fields, Chicago; the Potter-Palmers, Chicago, and Lehman Brothers, New York.

Propose Drill Standards

NEW YORK, April 1—A proposed American standard for twist drill sizes and lengths (Proposal C) has been developed by technical committee No. 7 of the sectional committee on the Standardization of Small Tools and Machine Tool Elements. This proposal has been based on Proposals A and B, but modified as a result of the comments on those proposals which were received by the committee as distributed for criticism and comment to industry on July 5, 1929. This proposal covers a size range of .014 to 11/16 (.6875) in., and is now being widely distributed for general comments and criticisms.

Ford German Stockholders Meet

BERLIN, March 31—The Ford Motor Co. for the first time today held a general meeting of its American and German shareholders in Berlin. Mr. Ford himself was represented by his investment company located in Vaduz, Liechtenstein.

The profits reported amounted to 200,000 marks (about $48,000) and a 10 per cent dividend was announced. The report forecast an increase of 66 per cent in the output for the current year, depending, however, how contemplated automobile duties work out, concerning which there is yet uncertainty.

The report did not mention the new Cologne plant, as this was only acquired on Jan. 20. Charles E. Sorensen, of Detroit, was elected to the board.

Diesel Fuel Supply Planned

SAN DIEGO, Cal., April 2—The Texas Co. will have available at points adjacent to, or on, more than 300 airports a fuel suitable for use in the new Packard Diesel aircraft engine immediately on the introduction of that engine into general use, according to announcement made by Captain Frank M. Hawks, superintendent of the aviation division of the company.

Indianapolis Automotive Employment Holds Steady

Last Year's Level Is Maintained In Automobile Factories

INDIANAPOLIS, April 2—Employment in the automotive plants of Indianapolis, while not reaching the total of a year ago, does not have the pessimistic cast that many would give the situation. With the Stutz plant working merely to fill orders that come in from time to time, which hardly takes all the time of one production line, most of the plants here report either equal with last year or gains for February.

Marmon officials report that in February, 1929, an average daily payroll of $1,514 was carried, while this year for the same month this figure has been increased to $1,641. The Ford factory branch reported February approximately even with last year, with anticipated increases for the future, because of new manufacturing processes being started here some few weeks ago. Stutz reported as unable to give a comparison as operation restarted only shortly.

National Metal Exhibit Will Be Held in Chicago

Both Technical Sessions and Show Are Scheduled for Stevens Hotel

CLEVELAND, April 3—Floor plans of the twelfth annual National Metal Exposition which will be held at the Stevens Hotel in Chicago, Sept. 22-26, have been mailed to prospective exhibitors, according to W. H. Eiseman, secretary of the American Society for Steel Treating and director of the exposition.

For the first time all activities of the National Metal Congress and Exposition will take place under one roof. Technical sessions, the annual meeting of the Society, and other features of the Congress will all be held in the hotel.

The 1930 show will cover approximately 75,000 sq. ft. of floor space. On the first floor of the hotel, in the great exhibition hall and foyer, will be set up the heavy displays. Second floor exhibits will be located in the grand ball room and its foyer, and in the lounge, writing room and main dining room of the hotel. No restrictions are imposed by the exposition management as to the showing of heavy machinery, whether or not in operation.

A unique feature of the exposition is its all-expense cost to the exhibitors, a new departure in show management. The exhibitor's booth rental includes cost of cartage to and from the railroad terminals; erection and dismantling of exhibits; the installation of connections for gas, electricity, air and water as well as the cost of the current, gas, etc.

U. S. Rubber Sells N. J. Plant

TRENTON, N. J., April 2—The United States Rubber Co. has sold its buildings at New Brunswick, N. J., to Michael Jelin, of that place. The plants have been idle for several years.

Stokes Plans New Building

TRENTON, N. J., April 2—The Joseph Stokes Rubber Co. will erect a new machine shop for the manufacture of molds for automobile battery cases and other goods. The building will be two stories, 50 by 130 ft.

Coming Feature Issues of Chilton Class Journal Publications

***Commercial Car Journal and Operation & Maintenance*—Special Truck Equipment Issue, April, 1930.**

Crude Oil Production Down

NEW YORK, April 2—Daily average gross crude oil production in the United States for the week ending March 22, according to the American Petroleum Institute, was 2,535,900 bbl., as compared with 2,583,200 bbl. for the preceding week, a decrease of 47,300 bbl.

Imports of petroleum at the principal United States ports for the week ended March 22 totaled 1,236,000 bbl., a daily average of 176,571 bbl., compared with 2,064,000 bbl., a daily average of 294,857 bbl. for the week ended March 15, and a daily average of 257,893 bbl. for the four weeks ended March 22.

Report Detroit Car Loadings

DETROIT, April 2—Automobile factories in the territory of the Great Lakes regional advisory board have estimated their freight car requirements for the second quarter of 1930 as 121,680, as compared with actual requirements for the same period last year of 149,917, a decrease of about 18 per cent, it was reported by K. A. Moore, manager of the Detroit office of the National Automobile Chamber of Commerce.

Uses Large Quantity of Gasoline

PHILADELPHIA, April 3—At the annual rate of more than 100 gal. per capita, Pennsylvania is consuming nearly five per cent of the world production of gasoline, according to W. D. Anderson, vice-president in charge of exports for the Atlantic Refining Co. in an address before the Philadelphia Real Estate Board. Exclusive of the United States and with the possible exception of the United Kingdom, he said, this is more than is consumed annually by any country, or any continent, in the world.

Vehicle Output Estimated

NEW YORK, April 3—Production during February amounted to approximately 315,000 units in the United States and Canada. While the production of the members of the National Automobile Chamber of Commerce has not yet been compiled, and will not be available at the time of the directors' meeting next week, unofficial estimates of their production place it at approximately 205,000 units.

Defiance Plugs Sales Gain

COLUMBUS, OHIO, April 2—District managers from Ohio, Michigan, Indiana, West Virginia and Pennsylvania of the Defiance Spark Plugs, Inc., of Toledo, met in a sales conference here March 27 with about two score in attendance. The meeting was addressed by Raymond P. Lipe, president; L. L. Seigfried, vice-president; C. R. Kellogg, regional sales manager, and Ralph Markey, district manager. Mr. Seigfried announced that sales of the company are more than 100 per cent ahead of 1929.

Calendar of Coming Events

SHOWS

Detroit (All-American Aircraft)..April 5-13
Asbury Park, N. J., Automobile..April 7-12
Berlin, International Automobile..Nov. 6-16

CONVENTIONS

Society of Automotive Engineers, Aeronautic Meeting, Detroit.....April 8-10
Society of Automotive Engineers, Aeronautic Meeting, New York.....May 8
American Society Mechanical Engineers, Fiftieth Anniversary Celebration:
New York .....April 5
Hoboken, N. J. .....April 7
Washington, D. C. .....April 8-9
National Council Meeting of the U. S. Chamber of Commerce, Washington .....April 28
U. S. Chamber of Commerce Annual Meeting, Washington...April 28-May 1
National Foreign Trade Conference, Los Angeles .....May 21-23
A. S. M. E., Semi-Annual Meeting, Detroit .....June 9-12
A. S. M. E., Oil, Power & Gas Div. State College, Pa. .....June 12-14
Society of Automotive Engineers, Summer Meeting, French Lick Springs May 25-29
World Power Conference, Berlin..June 16-25
Railway Supply Mfrs. Assn., Meeting and Exhibit, Atlantic City..June 18-25
American Railway Association, San Francisco .....June 23-26
American Society for Testing Materials, Annual Meeting, Atlantic City .....June 23-27
Steel Founders Soc. (Midsummer Convention) White Sulphur Springs June 26-28
National Safety Council, Annual Safety Congress, Pittsburgh....Sept. 29-Oct. 4
Sixth International Road Congress, Washington, D. C. .....Oct. 6-11
Exhibition—American Roadbuilders Association, Washington, D. C....Oct. 6-11
Motor and Equipment Association, Convention, Cleveland.....Nov. 10-14

RACES

Daytona Beach, Fla., Speed Trials, April 1-15
Indianapolis .....May 30
Belgium .....July 5-6
Germany (Grand Prix) .....July 13
Belgium (European Grand Prix)....July 20
Spain .....July 27
Italy (Grand Prix) .....Sept. 7
France (Grand Prix) .....Sept. 21